

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-136557

(43)Date of publication of application : 21.05.1999

(51)Int.Cl.

H04N 5/225

H04N 5/91

(21)Application number : 10-236102

(71)Applicant : NIKON CORP

(22)Date of filing : 21.08.1998

(72)Inventor : EJIMA SATOSHI
NOZAKI HIROTAKE

(30)Priority

Priority number : 09229637

Priority date : 26.08.1997

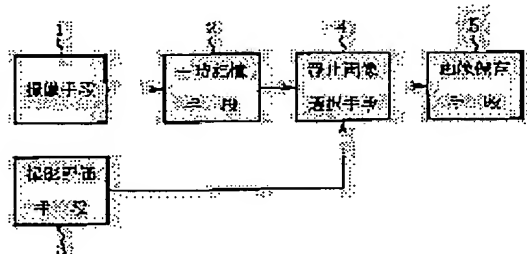
Priority country : JP

(54) ELECTRONIC CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide image data of a satisfactory photographing state such as less hand blurring on an electronic camera which image-picks up an object image and converts it into image data.

SOLUTION: An image pickup means 1 which continuously image-picks up an object, a temporary storage means 2 which temporarily stores plural pieces of image data that are continuously image-picked up by the image pickup means 1, a photographing evaluation means 3 evaluating the propriety of the photographing state on image data which is image-picked up by the image pickup means 1, a still image selection means 4 selecting image data whose evaluation from the photographing evaluation means 3 is the highest among image data stored in the temporary storage means 2 and an image preservation means 5 preserving image data selected by the still image selection means 4 are provided for the electronic camera.



LEGAL STATUS

[Date of request for examination]

01.07.2005

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision]

of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] An image pick-up means to picturize a photographic subject continuously, and a temporary storage means to store temporarily the image data of two or more sheets continuously picturized by said image pick-up means, A photography evaluation means to evaluate the quality of a photography condition about the image data picturized by said image pick-up means, The electronic camera characterized by equipping evaluation of said photography evaluation means with a static-image selection means to choose the highest image data, and an image preservation means to save the image data as which it was chosen by said static-image selection means from among the image data memorized by said temporary storage means.

[Claim 2] It is the electronic camera characterized by said temporary storage means starting the temporary storage of image data after release actuation of an electronic camera in an electronic camera according to claim 1.

[Claim 3] It is the electronic camera characterized by stopping renewal of data when the image data over [in an electronic camera according to claim 1, said temporary storage means incorporates new image data one by one from said image pick-up means in the standby condition of release actuation, carry out renewal of sequential of the image data in temporary storage, and] release actuation order in after release actuation of an electronic camera is stored temporarily.

[Claim 4] It is the electronic camera characterized by making the storage with same said temporary storage means and said image preservation means serve a double purpose in an electronic camera given in any 1 term of claim 1 thru/or claim 3.

[Claim 5] the image data of two or more sheets by which said temporary storage means is continuously picturized with said image pick-up means in an electronic camera given in any 1 term of claim 1 thru/or claim 4 — difference — the electronic camera characterized by being a means to compress and memorize.

[Claim 6] An image pick-up means to picturize a photographic subject continuously, and the storage which can memorize image data, A photography evaluation means to evaluate the quality of a photography condition about each image data picturized by said image pick-up means, A comparison means to compare evaluation of said photography evaluation means about the image data in said storage with evaluation of said photography evaluation means about the new image data from said image pick-up means, The electronic camera characterized by having the image overwrite means which carries out overwrite record of the image data new to said storage by the old and new comparison of said comparison means when evaluation of new image data is high.

[Claim 7] It is the electronic camera characterized by being a means by which said photography evaluation means detects the amount of Bure of said image pick-up means in an electronic camera given in any 1 term of claim 1 thru/or claim 6 as at least one of the quality evaluations of said photography condition.

[Claim 8] It is the electronic camera characterized by said photography evaluation means judging the spatial-frequency component of said image data in an electronic camera given in any 1 term of claim 1 or claim 7 as at least one of the quality evaluations of said photography condition.

[Claim 9] It is the electronic camera characterized by said photography evaluation means judging the amount of high-frequency components of spatial frequency in an electronic camera according to claim 8 based on the amount of compression signs of said image data.

[Claim 10] It is the electronic camera characterized by said photography evaluation means judging the release time lag which is the time amount gap with the electronic camera release actuation-and image pick-up time of image data in an electronic camera given in any 1 term of claim 1 thru/or claim 9 as at least one of the quality evaluations of said photography condition.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the electronic camera which picturizes a photographic subject image and records image data. Especially this invention relates to a technique for blurring to record the good image data of photography conditions, such as being few.

[0002]

[Description of the Prior Art] generally, in the case where camera photography is performed with a stock, it will be alike occasionally, it will carry out and blurring will be produced. If such blurring arises, since a field will flow and will be exposed, the image which faded to the whole is photoed. Thus, the edge part to which the fine detail of the whole screen is lost upwards, and a clear image should be reflected distinctly will flag. Therefore, it becomes the image which is not very good as for an impression.

[0003] The camera with a blurring amendment device is known as what cancels the fault by such blurring conventionally. Drawing 13 is drawing showing this kind of camera with a blurring amendment device. A taking lens 92 is attached in the front face of a camera 91 in drawing 13. In the lens-barrel of a taking lens 92, the Bure amendment optical system 93 is arranged free [rotation].

[0004] Rotation of the biaxial coreless motors 94 and 95 is transmitted, and this Bure amendment optical system 93 vibrates to the upper and lower sides and right and left. On the other hand, the amount detection sensor 96 of Bure which detects the amount of Bure of a longitudinal direction, and the amount detection sensor 97 of Bure which detects the amount of Bure of the vertical direction are arranged at a camera 91 side. With the camera 91 of such a configuration, vibration of the body of a camera is detected using the amount detection sensors 96 and 97 of Bure. A camera 91 drives coreless motors 94 and 95 to vibration and hard flow which were detected, and vibrates the optical axis of the Bure amendment optical system 93. Consequently, vibration of a photography optical axis is negated and the good photograph with which blurring was amended can be taken.

[0005]

[Problem(s) to be Solved by the Invention] By the way, in such a conventional example, the Bure amendment optical system 93 was arranged in the taking lens 92. Therefore, enlargement and the trouble of weight-izing had a taking lens 92. Moreover, the tooth space which arranges the Bure amendment optical system 93 had to be secured in the taking lens 92, and there was a trouble that the design degree of freedom of a taking lens 92 became low.

[0006] Furthermore, the internal reflection of the part which established the Bure amendment optical system 93 in a taking lens 92 increases. Therefore, there was a trouble of being easy to produce the flare in the time of backlight photography etc. Moreover, in case the Bure amendment optical system 93 is driven, in order to consume power, there was a trouble that battery life became short.

[0007] Furthermore, when driving the Bure amendment optical system 93, there was also a trouble that the noise was slightly made. Moreover, on the other hand, the blurred image is generated also in not only blurring but photographic subject Bure and focus gap which were

mentioned above. However, since it was only negating vibration of a camera, the conventional blurring amendment device had the trouble that it could not prevent at all, about these photographic subject Bure and focus gaps.

[0008] Especially, with high-resolution-izing and the miniaturization of an image sensor in recent years, the light-receiving area per pixel is reduced increasingly, and the effective sensibility of an image sensor is low. Therefore, generally the exposure time of an image sensor tends to become long, and the frequency which blurring and photographic subject Bure generate is high much more. Therefore, especially in the electronic camera, a cure to these blurring or photographic subject Bure is desired immediately. Moreover, it was very difficult to prevent focus gap correctly also in the conventional AF (automatic focusing) photography about the photographic subject in which the motion which cannot be predicted is shown like the flower which shakes by the wind. Therefore, an electronic camera which cancels focus gap certainly under such an ill condition is desired strongly.

[0009] So, in invention given in any 1 term of claims 1-10, in order to solve an above-mentioned trouble, it aims at offering the electronic camera which can obtain the good image data of a photography condition certainly. Especially, it aims at offering the electronic camera which can attain power-saving in invention according to claim 2.

[0010] It aims at offering the electronic camera which can reduce by half the worst value of release time lag mostly in invention according to claim 3. It aims at offering the electronic camera which simplified the configuration in invention according to claim 4. It aims at reducing the memory capacity of a temporary storage means (after-mentioned), or increasing the sample size of image data in invention according to claim 5.

[0011] It aims at offering the electronic camera which can exclude a temporary storage means (after-mentioned) in invention according to claim 6. It aims at offering the electronic camera which can obtain good image data with little blurring in invention according to claim 7. It aims at offering the electronic camera which can obtain good image data with little photographic subject Bure and focus gap in invention according to claim 8. It aims at offering the electronic camera which can analyze a spatial-frequency component efficiently in invention according to claim 9. Release time lag aims at offering the electronic camera which can obtain small good image data in invention according to claim 10.

[0012]

[Means for Solving the Problem]

(Claim 1) Drawing 1 is an outline block diagram for explaining invention according to claim 1. An image pick-up means 1 by which invention according to claim 1 picturizes a photographic subject continuously, A temporary storage means 2 to store temporarily the image data of two or more sheets continuously picturized by the image pick-up means 1, A photography evaluation means 3 to evaluate the quality of a photography condition about the image data picturized by the image pick-up means 1, From from, it is characterized by having a static-image selection means 4 by which evaluation of the photography evaluation means 3 chooses the highest image data, and an image preservation means 5 to save the image data chosen by the static-image selection means 4 among the image data memorized by the temporary storage means 2.

[0013] (Claim 2) Invention according to claim 2 is characterized by the temporary storage means 2 starting the temporary storage of image data after release actuation of an electronic camera in an electronic camera according to claim 1.

[0014] (Claim 3) In an electronic camera according to claim 1, invention according to claim 3 is characterized by stopping renewal of data, when the temporary storage means 2 incorporates new image data one by one from the image pick-up means 1, carries out renewal of sequential of the image data in temporary storage in the standby condition of release actuation and stores temporarily the image data over release actuation order after release actuation of an electronic camera.

[0015] (Claim 4) Invention according to claim 4 is characterized by using the storage with same temporary storage means 2 and image preservation means 5 also [term / of claim 1 thru/or claim 3 / any 1] in the electronic camera of a publication.

[0016] (Claim 5) the image data of two or more sheets by which the temporary storage means 2

is continuously picturized for invention according to claim 5 with the image pick-up means 1 in an electronic camera given in any 1 term of claim 1 thru/or claim 4 — difference — it is characterized by being a means to compress and memorize.

[0017] (Claim 6) Drawing 2 is an outline block diagram for explaining invention according to claim 6. An image pick-up means 1 by which invention according to claim 6 picturizes a photographic subject continuously, The storage 10 which can memorize image data, and a photography evaluation means 3 to evaluate the quality of a photography condition about each image data picturized by the image pick-up means 1, A comparison means 11 to compare evaluation of the photography evaluation means 3 about the image data in a storage 10 with evaluation of the photography evaluation means 3 about the new image data from the image pick-up means 1, It is characterized by having the image overwrite means 12 which carries out overwrite record of the image data new to a storage 10 by the comparison of the comparison means 11 when evaluation of new image data is high.

[0018] (Claim 7) Invention according to claim 7 is characterized by the photography evaluation means 3 being a means to detect the amount of Bure of the image pick-up means 1, as at least one of the quality evaluations of a photography condition in an electronic camera given in any 1 term of claim 1 thru/or claim 6.

[0019] (Claim 8) Invention according to claim 8 is characterized by the photography evaluation means 3 judging the spatial-frequency component of image data as at least one of the quality evaluations of a photography condition in an electronic camera given in any 1 term of claim 1 or claim 7.

[0020] (Claim 9) Invention according to claim 9 is characterized by the photography evaluation means 3 judging the amount of high-frequency components of spatial frequency in an electronic camera according to claim 8 based on the amount of compression signs of image data.

[0021] (Claim 10) It is characterized by invention according to claim 10 judging the release time lag whose photography evaluation means 3 is the time amount gap with the electronic camera release actuation—and image pick-up time of image data as at least one of the quality evaluations of a photography condition in an electronic camera given in any 1 term of claim 7 thru/or claim 9.

[0022] << — operation explanation >> for every claim — in the electronic camera in connection with claim 1, the image pick-up means 1 picturizes a photographic subject image continuously. Thus, the picturized image data of two or more sheets is stored temporarily for the temporary storage means 2. On the other hand, the photography evaluation means 3 evaluates the quality of a photography condition about each image data. The static-image selection means 4 chooses from from the image data by which evaluation of this photography condition was picturized at the highest period among the image data memorized by the temporary storage means 2. The image preservation means 5 saves this selected image data.

[0023] By the above actuation, the good image data of a photography condition can be alternatively obtained with the electronic camera of claim 1. Moreover, in the electronic camera of claim 1, the temporary storage means 2 once memorizes image data especially during a photography period. Therefore, since it is sufficient if selection processing of image data is performed after the completion of photography, it becomes possible to mitigate the processing actuation during a photography period reasonable.

[0024] In the electronic camera in connection with claim 2, the temporary storage means 2 starts the temporary storage of image data after release actuation of an electronic camera. Therefore, the good image data of a photography condition will be chosen from from among the image data after release actuation. If it is in such actuation, it is not necessary to always perform image pick-up actuation etc. that what is necessary is just to start actuation after release actuation. Therefore, it becomes possible to attain power-saving of an electronic camera.

[0025] In the electronic camera in connection with claim 3, waiting [of release actuation] and the temporary storage means 2 incorporate new image data one by one from the image pick-up means 1. The temporary storage means 2 updates image data using this new image data, and maintains the image data of two or more sheets in temporary storage at the newest condition. If release actuation of the electronic camera is carried out in this condition, when the temporary

storage means 2 stores temporarily the image data over release actuation order, it will stop renewal of data.

[0026] By such actuation, the sample section of the image data which remains for the temporary storage means 2 turns into the section over release actuation order. Especially, in just before release actuation, blurring accompanying release actuation hardly arises. Therefore, possibility that the still fewer image data of blurring can be chosen becomes very high by adding the period in front of such release to the sample section. Since the sample section of image data moreover straddles before and after release actuation, compared with the case where it allots only after release actuation, the worst value (it is equivalent to the time interval of the endpoint of the sample section and a release actuation time) of release time lag reduces by half the sample section of the same time amount length mostly.

[0027] In the electronic camera in connection with claim 4, the temporary storage means 2 and the image preservation means 5 make the same storage serve a double purpose. Therefore, the configuration of an electronic camera is simplified.

[0028] the image data by which the temporary storage means 2 is continuously picturized with the image pick-up means 1 in the electronic camera in connection with claim 5 — difference — it compresses and memorizes. difference here — compression — the difference between images — what is compressed in quest of data — it is — for example, simple inter-frame difference — the difference containing compression and techniques, such as motion compensation prediction, — it is compression etc. Usually, the image data by which a serigraphy is carried out with the image pick-up means 1 has very high correlation even if it is not comparable to the frame correlation in a dynamic image. therefore, the above difference — compression enables it to make the amount of signs of image data small much more.

[0029] Therefore, the sample size of image data memorizable for the temporary storage means 2 becomes possible [increasing]. Thus, when the sample size of image data increases, possibility that image data with a more good photography condition can be chosen becomes high. Moreover, in not increasing sample size of image data, it becomes possible to reduce the storage capacity of the temporary storage means 2.

[0030] In the electronic camera in connection with claim 6, the image pick-up means 1 picturizes a photographic subject image continuously. At this time, the photography evaluation means 3 evaluates the quality of a photography condition. The comparison means 11 compares the evaluation about the image data in a storage 10 with the new evaluation about the new image data from the image pick-up means 1. Here, when the new evaluation is higher, the image overwrite means 12 carries out overwrite record of the image data new to a storage 10. Consequently, the better image data of a photography condition will remain in a storage 10. Especially, it is not necessary to store temporarily all a series of image data, and a mass temporary storage means etc. becomes unnecessary in the electronic camera of claim 6.

[0031] In the electronic camera in connection with claim 7, the amounts of Bure of the image pick-up means 1 (the amount of vibration, angular velocity, etc.) are detected as quality evaluation of a photography condition. It can be estimated that there is little blurring and its photography condition is good, so that there are few amounts of Bure of the image pick-up means 1. Thus, it becomes possible by carrying out quality evaluation of a photography condition for the amount of Bure of the image pick-up means 1 to a scale to obtain image data with more little blurring.

[0032] In the electronic camera in connection with claim 8, the spatial-frequency component of image data is used as a scale of quality evaluation of a photography condition. Usually, the image data picturized continuously does not change the pattern itself so much, but it is assumed that distribution of spatial frequency is almost eternal. However, if blurring, photographic subject Bure, focus gap, etc. arise in these image data, image data will be graduated by it and the spatial-frequency component of a high region will be harmed.

[0033] Therefore, in these image data, there is less what has comparatively more spatial-frequency components of a high region synthetically, and blurring, photographic subject Bure, and focus gap can estimate it that a photography condition is better. Thus, it enables focus gap to choose little [synthetically] image data as blurring, photographic subject Bure, and a list exactly by carrying out quality evaluation of a photography condition for the spatial-frequency

component of image data to a scale.

[0034] In the electronic camera in connection with claim 9, the spatial-frequency component of image data is judged from the amount of compression signs. Usually, it can be judged that there are many spatial-frequency components of a high region, so that there are many amounts of compression signs. Therefore, in the image data picturized continuously, there is less what has more amounts of compression signs synthetically, and blurring, photographic subject Bure, and focus gap can estimate it that a photography condition is better. Moreover, since the value of such an amount of compression signs is acquired from the result of the picture compression processing from old, it does not need to add special processing.

[0035] In the electronic camera in connection with claim 10, release time lag is detected as at least one of the quality evaluations of a photography condition. It can be estimated that near and a photography condition are better to the shutter timing which a photography person means, so that there is little this release time lag. Thus, it becomes possible by considering as one item of quality evaluation of release time lag to choose image data with more little release time lag.

[0036] Moreover, especially the case where image data with little release time lag is chosen from before release actuation in the condition of storing the image pick-up image temporarily, like invention of claim 3 is explained. in this case, the moment of release actuation — by chance — exposure — naturally working possibility exists. Therefore, in single copy photography of an electronic camera, the release time lag which did not have nothing profit conventionally becomes possible [making image selection automatically and obtaining the image of zero] completely.

[0037] In addition, in the explanation of claims 7-10 mentioned above, on account of explanation, although it says that quality evaluation is performed only by one evaluation criteria, the contents of invention are not limited to this. What may carry out to the evaluation criteria of these plurality by establishing priority, carries out weighting to evaluation criteria, and performs synthetic evaluation is easy to be natural [quality evaluation]. Of course at this time, it does not matter even if evaluation criteria other than claim 7 - 10 are contained.

[0038] Moreover, the electronic camera in claims 1-10 mentioned above is not narrowly limited to the electronic camera of a simple substance configuration. An electronic camera in recent years is in the inclination constituted by an image pick-up unit and information machines and equipment (a computer, electronic notebook, etc.) as systems of two or more set machine — a separation configuration is carried out. In such a system configuration, it becomes possible to share actuation of this invention suitably between two or more set machines.

[0039] For example, the image data which carried out the seriography is stored temporarily in (1) image-pick-up unit side. (2) In an information-machines-and-equipment side, the assignment of carrying out selection preservation of the image according to quality evaluation of a photography condition out of the image data of these single strings of operation is possible. In addition, the actuation by the side of the information machines and equipment in such a case becomes possible [realizing] using the program (the recorded record medium in which machine reading is possible) which makes information machines and equipment perform "the step which acquires the result of quality evaluation from an image pick-up unit side, or performs quality evaluation of a photography condition from the spatial-frequency component of image data etc.", and "the step which carries out selection preservation of the image data according to the result of the quality evaluation."

[0040]

[Embodiment of the Invention] Hereafter, the gestalt of the operation in this invention is explained based on a drawing.

[0041] (1st operation gestalt) Drawing 3 is the block diagram showing the 1st operation gestalt. In addition, the 1st operation gestalt is an operation gestalt corresponding to invention given in claims 1, 2, 4, 5, and 7. A taking lens 22 is attached in the front face of an electronic camera 21 in drawing 3. The light-receiving side of an image sensor 23 is arranged at the image space side of this taking lens 22.

[0042] The image output of this image sensor 23 is directly memorized in an image memory 25 through the image-processing section 24 which performs chrominance-signal processing, A/D

conversion, gamma amendment, picture compression, etc. In addition, R/W of data is also performed in an image memory 25 through the data bus of a microprocessor 26. Moreover, in the case of an electronic camera 21, the amount detection sensors 29a and 29b of Bure which consist of angular-velocity sensors, such as a piezo-electric gyroscope, are arranged. This amount detection sensor of Bure 29a detects the amount of Bure of the vertical direction (pitching). Another amount detection sensor of Bure 29b detects the amount of Bure of a longitudinal direction (yawing). The output terminal of these amount detection sensors 29a and 29b of Bure is connected to the A/D input terminal of a microprocessor 26, respectively.

[0043] Furthermore, release ** 30 is arranged on the case top face of an electronic camera 21, and the switch output of release ** 30 is connected to a microprocessor 26. Moreover, the control signal of the electronic shutter from a microprocessor 26 is given to the CCD drive circuit 31. The CCD drive circuit 31 generates a driving pulse according to this control signal, and gives it to an image sensor 23. In addition, a timer 32 and the infrared transfer interface 33 are connected to a microprocessor 26.

[0044] in addition, about the correspondence relation between invention given in claims 1, 2, 4, 5, and 7, and the 1st operation gestalt Compress and it corresponds to function" stored temporarily. the image pick-up means 1 — an image sensor 23 and the CCD drive circuit 31 — corresponding — the temporary storage means 2 — "image data of an image memory 25 and the image-processing section 24 — difference — The photography evaluation means 3 corresponds to the amount detection sensors 29a and 29b of Bure, and the static-image selection means 4 corresponds to "the function which chooses image data based on the amount of Bure" of a microprocessor 26. The image preservation means 5 corresponds to "the function to save the selected image data" of an image memory 25 and a microprocessor 26.

[0045] Next, actuation of the 1st operation gestalt is explained. Drawing 4 is a flow chart explaining actuation of the 1st operation gestalt. First, if the main power supply of an electronic camera 21 is switched on, a microprocessor 26 will stand by until release ** 30 is pushed (NO side of drawing 4 S1). Here, if release ** 30 is pushed (YES side of drawing 4 S1), a microprocessor 26 will start the CCD drive circuit 31, and will once discharge the unnecessary charge in an image sensor 23. According to the brightness of the photographic subject image projected on a light-receiving side, a signal charge is newly accumulated in an image sensor 23 after discharge of such an unnecessary charge (drawing 4 S2).

[0046] During the are recording period of such a signal charge, a microprocessor 26 acquires the amount W1 of Bure of the vertical direction from amount detection sensor of Bure 29a. The amount W2 of Bure of a longitudinal direction is acquired from another amount detection sensor of Bure 29b. A microprocessor 26 computes the sum of a square value, or the sum of an absolute value about the amounts W1 and W2 of these Bure, and is taken as the amount W of Bure of the electronic camera 21 whole (drawing 4 S3).

[0047] If the storage time defined beforehand passes, a microprocessor 26 will read image data from an image sensor 23 through the CCD drive circuit 31 (drawing 4 S4). After the image-processing section 24 performs A/D conversion, gamma amendment, picture compression, etc. to this image data, it is recorded on the temporary storage in an image memory 25 as it is. in addition, the difference as MPEG etc. with the same picture compression here — compression is applied. Moreover, a microprocessor 26 associates and records the amount W of Bure on image data at this time (drawing 4 S5).

[0048] A series of actuation S2-S5 mentioned above is repeatedly performed until time limit 0.3 seconds pass since release actuation (YES side of drawing 4 S6). The image data for the multiple frame picturized in 0.3 seconds after release actuation is recorded on the inside of an image memory 25 by the actuation so far together with the amount W of Bure in an image pick-up period.

[0049] A microprocessor 26 looks for the smallest value out of these amounts W of Bure, and finds out image data A currently picturized at the period when the amount W of Bure small No. 1 was detected (drawing 4 S7). Incidentally, drawing 5 is drawing having shown the situation of time amount change of the general amount W of Bure. It is expectable that the amount W of Bure becomes min about once [at least] in 0.3 seconds that this drawing 5 shows. Therefore, image data A chosen as mentioned above has fully little blurring, and it is expected that it is

good image data.

[0050] A microprocessor 26 records this image data A on the saved area in an image memory 25 (drawing 4 S8). In addition, preservation processing of image data A may be finished by performing the management domain of an image memory 25, modification of a file attribute, etc., without actually moving image data A in an image memory 25. moreover, image data A — difference — what is necessary is to newly carry out JPEG compression and just to save, after carrying out image expanding when compressed

[0051] By actuation explained above, the amount W of Bure chooses the smallest image data from from among the image data picturized continuously with the 1st operation gestalt. Therefore, it becomes possible to obtain image data with little blurring, without using a blurring amendment device like before entirely. Moreover, since it becomes unnecessary to arrange the optical system for blurring amendment in a taking lens 22, a miniaturization and lightweight-izing of a taking lens 22 can be attained easily.

[0052] Naturally the need of securing the tooth space for moreover arranging the optical system for blurring amendment in a taking lens 22 is also lost, and the design degree of freedom of a taking lens 22 becomes high. Therefore, it becomes possible to raise the aberration engine performance of a taking lens 22 reasonable. Furthermore, since the internal reflection by the optical system for blurring amendment is canceled, the flare at the time of backlight photography etc. is mitigated.

[0053] Moreover, since the drive for blurring amendment etc. becomes unnecessary, it becomes possible to attain power-saving and to extend battery life. Furthermore, the fault that the noise and vibration arise from the drive for blurring amendment is also canceled. Moreover, since the image memory 25 is used also [both / the object for the temporary storage of image data, and for preservation], it is not necessary to form an image memory separately, and the configuration of an electronic camera 21 can be simplified.

[0054] In addition, with the operation gestalt mentioned above, although the storage region of an image memory 25 is assigned to temporary storage and a saved area fixed, it is not limited to this. For example, you may make it assign the temporary storage in an image memory 25 dynamically. With such a configuration, it becomes possible by sparing temporary storage for a saved area gradually to save image data to the limit of the storage region of an image memory 25. Next, another operation gestalt is explained.

[0055] (2nd operation gestalt) Drawing 6 is the block diagram showing the 2nd operation gestalt. In addition, the 2nd operation gestalt is an operation gestalt corresponding to invention given in claims 1, 3, 7, and 10. A taking lens 42 is attached in the front face of an electronic camera 41 in drawing 6 . The light-receiving side of an image sensor 43 is arranged at the image space side of this taking lens 42.

[0056] The image output from an image sensor 43 is connected to the data input of an image memory 45 through the image-processing section 44 which performs chrominance-signal processing, A/D conversion, gamma amendment, etc. On the other hand, the data output of an image memory 45 is connected to the data input of a microprocessor 46. Moreover, a memory card 48 is connected to the data output terminal of a microprocessor 46 free [attachment and detachment] through the image recording section 47.

[0057] On the other hand, inside [case] an electronic camera 41, the amount detection sensors 49a and 49b of Bure which consist of angular-velocity sensors, such as a piezo- ... electric gyroscope, are arranged. The output of these amount detection sensors 49a and 49b of Bure is connected to the A/D input terminal of a microprocessor 46, respectively. Furthermore, release ** 50 is arranged on the case top face of an electronic camera 41, and the switch output of release ** 50 is connected to a microprocessor 46.

[0058] Moreover, the control signal of the electronic shutter from a microprocessor 46 is given to the CCD drive circuit 51. The CCD drive circuit 51 generates a driving pulse according to this control signal, and gives it to an image sensor 43. In addition, a timer 52 is connected to a microprocessor 46. in addition, about the correspondence relation between invention given in claims 1, 3, 7, and 10, and the 2nd operation gestalt The image pick-up means 1 corresponds to an image sensor 43 and the CCD drive circuit 51, and the temporary storage means 2 corresponds to "the function which stores temporarily the image data before and behind release

actuation" of an image memory 45 and the image-processing section 44. The photography evaluation means 3 corresponds to "the function which measures release time lag" of the amount detection sensors 49a and 49b of Bure, a timer 52, and a microprocessor 46. The static-image selection means 4 corresponds to "the function which chooses image data based on an evaluation value" of a microprocessor 46, and the image preservation means 5 corresponds to the image recording section 47 and a memory card 48.

[0059] Next, actuation of the 2nd operation gestalt is explained. Drawing 7 is a flow chart explaining actuation of the 2nd operation gestalt. First, if the main power supply of an electronic camera 41 is switched on, a microprocessor 46 will once discharge the unnecessary charge in an image sensor 43 through the CCD drive circuit 51. With an image sensor 43, a signal charge is accumulated after discharge of such an unnecessary charge according to the brightness of the photographic subject image projected on a light-receiving side (drawing 7 S11).

[0060] During the are recording period of this signal charge, a microprocessor 46 acquires the amount W1 of Bure of the vertical direction from amount detection sensor of Bure 49a. The amount W2 of Bure of a longitudinal direction is acquired from another amount detection sensor of Bure 49b. A microprocessor 46 computes the sum of a square value, or the sum of an absolute value about the amounts W1 and W2 of these Bure, and is taken as the amount W of Bure of the electronic camera 41 whole (drawing 7 S12).

[0061] Next, a microprocessor 46 acquires the present time of day from a timer 52 as image pick-up time of day Te (drawing 7 S13). If the storage time defined beforehand passes in this condition, a microprocessor 46 will read image data from an image sensor 43 through the CCD drive circuit 51 (drawing 7 S14).

[0062] After the image-processing section 44 performs A/D conversion, gamma amendment, etc. to this image data, it is stored temporarily in an image memory 45 (drawing 7 S15). At this time, a microprocessor 46 relates the amount W of Bure, and the image pick-up time of day Te with image data, and memorizes them (drawing 7 S17). In addition, at this time, when the image data in an image memory 45 amounts to seven frames, it replaces with the oldest data in (drawing 7 S16) and an image memory 45, and overwrite record of the newest data is already carried out (drawing 7 S18).

[0063] Here, a microprocessor 46 judges whether release ** 50 was pushed (drawing 7 S19). When release ** 50 is pushed (YES side of drawing 7 S19), a microprocessor 46 acquires the present time of day from a timer 52, and memorizes it as time of day Tr of release actuation (drawing 7 S20).

[0064] Of operation S11-20 mentioned above are repeatedly performed until the image data after release actuation is recorded by four frames (NO side of drawing 7 S21). On the other hand, if the image data after release actuation is recorded by four frames (YES side of drawing 7 S21), a microprocessor 46 will perform selection of image data in the following procedure, after suspending image pick-up actuation. First, a microprocessor 46 computes the evaluation value E using (1) type about each image data in an image memory 45 (drawing 7 S22).

[0065]
Evaluation value $E = \alpha |Te - Tr| + \beta |W| \dots (1)$

Here, the 1st term of the right-hand side is a term about release time lag, and the 2nd term is a term about the amount W of Bure. Moreover, multipliers alpha and beta perform weighting of these 2nd term (for example, set as $\alpha = 1$, $\beta = 1$, etc.). A microprocessor 46 looks for the smallest value out of each evaluation value E, and finds out image data A related with the evaluation value E small No. 1 (drawing 7 S23).

[0066] A microprocessor 46 reads this image data A from an image memory 45, and carries out picture compression. A microprocessor 46 saves image data A by which picture compression was carried out through the image recording section 47 at a memory card 48 (drawing 7 S24). In addition, about processing of picture compression, you may finish in steps S17 and S18 shown in drawing 7 instead of carrying out here.

[0067] Next, a microprocessor 46 returns actuation to step S11, after initializing an image memory 45 and control data (drawing 7 S25). By a series of actuation explained above, the evaluation value E chooses the smallest image data from from among the image data picturized continuously with the 2nd operation gestalt. Therefore, it enables release time lag to obtain

small image data on the basis of the evaluation value E that there is little blurring.

[0068] Moreover, more proper image data can be chosen from the image data over release actuation order, without being limited after release actuation, since image data is chosen. In addition, with the 2nd operation gestalt mentioned above, although the temporary storage of image data is started from the injection time of a main power supply, this invention is not limited to this. For example, a microprocessor 46 may detect the half-push of release ** 50, and may start the temporary storage of image data from the half-push time. With such a configuration, since it is not necessary to always store image data temporarily, it becomes possible to attain power-saving of an electronic camera. Next, another operation gestalt is explained.

[0069] (3rd operation gestalt) Drawing 8 is the block diagram showing the 3rd operation gestalt. In addition, the 3rd operation gestalt is an operation gestalt corresponding to invention given in claims 6 and 7. A taking lens 62 is attached in the front face of an electronic camera 61 in drawing 8. The light-receiving side of an image sensor 63 is arranged at the image space side of this taking lens 62.

[0070] The image output of an image sensor 63 is given to a microprocessor 65 through the image-processing section 64 which performs chrominance-signal processing, A/D conversion, gamma amendment, etc. Moreover, an image memory 66 is connected to the data bus of a microprocessor 65. Furthermore, a memory card 68 is connected to the data output terminal of a microprocessor 65 free [attachment and detachment] through the image recording section 67.

[0071] Moreover, inside [case] an electronic camera 61, the amount detection sensors 69a and 69b of Bure which consist of angular-velocity sensors, such as a piezo-electric gyroscope, are arranged. The output of these amount detection sensors 69a and 69b of Bure is connected to the A/D input terminal of a microprocessor 65, respectively. Furthermore, release ** 70 is arranged on the case top face of an electronic camera 61, and the switch output of release ** 70 is connected to a microprocessor 65.

[0072] Moreover, the control signal of the electronic shutter from a microprocessor 65 is given to the CCD drive circuit 71. The CCD drive circuit 71 generates a driving pulse according to this control signal, and gives it to an image sensor 63. In addition, about the correspondence relation between invention given in claims 6 and 7, and the 3rd operation gestalt The image pick-up means 1 corresponds to an image sensor 63 and the CCD drive circuit 71, and the photography evaluation means 3 corresponds to the amount detection sensors 69a and 69b of Bure. A storage 10 corresponds to an image memory 66, the comparison means 11 corresponds to "the function to perform the old and new comparison of the amount of Bure" of a microprocessor 65, and the image overwrite means 12 corresponds to "the function which overwrites image data in an image memory 66" of a microprocessor 65.

[0073] Next, actuation of the 3rd operation gestalt is explained. Drawing 9 is a flow chart explaining actuation of the 3rd operation gestalt. First, if the main power supply of an electronic camera 61 is switched on, a microprocessor 65 will determine the maximum allowed value of the amount of Bure based on present shutter speed and a present focal distance (drawing 9 S31).

[0074] Next, a microprocessor 65 initializes the maximum allowed value determined in this way in the amount Wmin of minimum Bure (drawing 9 S32). A microprocessor 65 returns to step S31, and repeats the above-mentioned actuation periodically until release ** 70 is pushed (NO side of drawing 9 S33). a period if release ** 70 is pushed (YES side of drawing 9 S33), until a microprocessor 65 will pass for 0.5 seconds from the point in time of release actuation on the other hand — step S35-40 are repeated and performed as follows (drawing 9 S34).

[0075] First, a microprocessor 65 once discharges the unnecessary charge in an image sensor 63 through the CCD drive circuit 71. With an image sensor 63, a signal charge is accumulated after discharge of such an unnecessary charge according to the brightness of the photographic subject image projected on a light-receiving side (drawing 9 S35). During the are recording period of this signal charge, a microprocessor 65 acquires the amount W1 of Bure of the vertical direction from amount detection sensor of Bure 69a. The amount W2 of Bure of a longitudinal direction is acquired from another amount detection sensor of Bure 69b. A microprocessor 65 computes the sum of a square value, or the sum of an absolute value about the amounts W1 and W2 of these Bure, and is taken as the amount W of Bure of the electronic camera 61 whole

(drawing 9 S36).

[0076] Here, a microprocessor 65 carries out the size comparison of the amount W_{min} of minimum Bure, and the amount W of Bure. As a result of such a comparison, when the amount W of Bure is larger, a microprocessor 65 returns actuation to step S34 (the NO side of drawing 9 S37), without reading image data from an image sensor 63.

[0077] In addition, at the time of this decision, when a microprocessor 65 makes an unnecessary charge discharge from an image sensor 63, if possible, the charge storage of degree coma may be started early. According to such actuation, it becomes possible to eliminate the useless storage time as much as possible, and to increase the photography number of sheets per unit time amount reasonable. On the other hand, (the YES side of drawing 9 R>9S37), when the amount W of Bure is smaller, a microprocessor 65 reads image data from an image sensor 63, after the storage time defined beforehand passes (drawing 9 S38).

[0078] A microprocessor 65 incorporates this image data through the image-processing section 64, and carries out overwrite record in an image memory 66 (step S39). After a microprocessor 65 sets this amount W of Bure as the amount W_{min} of minimum Bure with such overwrite record (step S40), actuation is returned to step S34.

[0079] After performing repeatedly a series of operation S34-40 mentioned above until time limit 0.5 seconds pass since release actuation, a microprocessor 65 shifts actuation to step S41. The smallest image data of the amount W of Bure is recorded on an image memory 66 by the actuation so far in the image data picturized in 0.5 seconds after release actuation.

[0080] In such a case, (YES side of drawing 9 S41), after a microprocessor 65 carries out picture compression of the image data which remained in the image memory 66, it is saved through the image recording section 67 at a memory card 68 (drawing 9 S43). In addition, about processing of picture compression, you may finish in step S39 shown in drawing 9 instead of carrying out here. Thus, after completing preservation of image data, a microprocessor 65 returns actuation to step S31, after eliminating the image data in an image memory 66 in preparation for next photography actuation (drawing 9 S44).

[0081] In addition, in the case in which the amount W of Bure was not once less than the maximum allowed value of the amount of Bure, no image data is recorded on an image memory 66. Thus, when image data does not exist in the image memory 66 (NO side of drawing 9 S41), after judging that the microprocessor 65 had too large blurring and processing "blurring warning", actuation is returned to step S31 (drawing 9 S42).

[0082] By actuation explained above, image data with more few amounts of Bure will be left to an image memory 66 with the 3rd operation gestalt. Therefore, image data with little blurring can be obtained, without using no conventional blurring amendment device. Moreover, since overwrite record of the image data will be carried out one after another, if an image memory 66 has the capacity which memorizes the image data for at least one frame, it is enough.

[0083] In addition, with the 3rd operation gestalt, although it has left image data with more few amounts of Bure to the image memory 66 based on the comparison of the amount of Bure, it is not limited to this. The image data which it leaves to an image memory 66 on the basis of the evaluation value containing the evaluation criteria of claims 7-10 etc. may be chosen. Moreover, although no image data is recorded with the 3rd operation gestalt when the amount W of Bure is not less than "the maximum allowed value of the amount of Bure", it is not limited to this. For example, the first image data etc. is recorded for the time being, and whenever the amount W of Bure is less, you may make it update image data about it or subsequent ones. Finally with such a configuration, the amount W of Bure can record the smallest image data.

[0084] In addition, with the 1-3rd operation gestalten, although only the image data for one sheet is saved on the basis of the amount of Bure, or an evaluation value, it is not limited to this. For example, you may make it save the image data for ***** from the high order of evaluation ranking on the basis of the amount of Bure, or an evaluation value. With such a configuration, the operator itself can choose the more desirable image data of a shutter chance from among the image data for ***** later. Next, another operation gestalt is explained.

[0085] (4th operation gestalt) Drawing 10 is the block diagram showing the 4th operation gestalt. In addition, the 4th operation gestalt is an operation gestalt corresponding to invention given in claims 1, 2, and 8. A zoom lens 102 is attached in the front face of an electronic

camera 101 in drawing 10 . The light-receiving side of an image sensor 103 is arranged at the image space side of this zoom lens 102.

[0086] The image output from an image sensor 103 is connected to picture compression section 106a through the image-processing section 104 which performs chrominance-signal processing, A/D conversion, gamma amendment, etc., and an image memory 105. The output of this picture compression section 106a is connected to a microprocessor 106. Moreover, a memory card 108 is connected to a microprocessor 106 free [attachment and detachment] through the image recording section 107.

[0087] Furthermore, release ** 110 and the photography mode selector button 111 are arranged, and the switch output of these control units is connected to the case of an electronic camera 101 at a microprocessor 106. Moreover, the control signal of the electronic shutter from a microprocessor 106 is given to the CCD drive circuit 112. The CCD drive circuit 112 generates a driving pulse according to this control signal, and gives it to an image sensor 103.

[0088] In addition, the flash section (the so-called stroboscope) 116 is formed in the encoder 115 and list which detect a focal distance from the photometry section 113 which measures the strength of the light in photographic subject brightness, the ranging section 114 which measures photographic subject distance, and a lens location, and it connects with an electronic camera 101 at a microprocessor 106, respectively. in addition, about the correspondence relation between invention given in claims 1, 2, and 8, and the 4th operation gestalt The image pick-up means 1 corresponds to an image sensor 103, the CCD drive circuit 112, and a zoom lens 102. The temporary storage means 2 corresponds to an image memory 105, and the photography evaluation means 3 corresponds to "the function to change image data into a spatial-frequency component" of picture compression section 106a. The static-image selection means 4 corresponds to "the function which chooses image data based on a spatial-frequency component" of a microprocessor 106, and the image preservation means 5 corresponds to the image recording section 107 and a memory card 108.

[0089] Next, actuation of the 4th operation gestalt is explained. Drawing 11 is a flow chart explaining actuation of the 4th operation gestalt. First, if the main power supply of an electronic camera 101 is switched on, a microprocessor 106 will stand by until release ** 110 is pushed (NO side of drawing 11 S1). Here, if release ** 110 is pushed (YES side of drawing 11 S1), a microprocessor 106 will distinguish the present photography mode (drawing 11 S2). When the present photography mode is not any of following the (1) - (3), either, a microprocessor 106 returns actuation to step S1, after performing the usual photography (recorded photography which carries out 1 coma image pick-up) (drawing 11 S3).

[0090] (1) Night view photography mode .. Cut flash luminescence and a focus is adjusted to infinite distance. Mode (2) macro mode which enables long duration exposure ... Mode (3) sport mode in which set the focus of a lens as a macro field and contiguity photography is performed .. The exposure time is set up as short as possible. Since especially possibility that blurring, photographic subject Bure, and focus gap will take place is high when mode one side and the current photography mode which photo the photographic subject which moves to a high speed are either of such photography modes, a microprocessor 106 performs cure actuation after step S4.

[0091] First, a microprocessor 106 directs the seriography for two or more sheets (three coma as [Here] an example) in the CCD drive circuit 112. The CCD drive circuit 112 reads the image data for three coma from an image sensor 103 in detail. The image data for these 3 coma is stored temporarily in an image memory 105, after chrominance-signal processing, a gamma correction, etc. are performed through the image-processing section 104 (drawing 11 S4).

[0092] Next, a microprocessor 106 directs DCT conversion (discrete cosine transform) to picture compression section 106a. About the image data for three coma in an image memory 105, picture compression section 106a incorporates the predetermined field (for example, middle of the screen) of a screen, and performs DCT conversion (drawing 11 S5). A microprocessor 106 incorporates the spatial-frequency component after DCT conversion, and chooses the image data containing the highest spatial-frequency component in three coma (drawing 11 S6).

[0093] Here, when the number of the selected image data is one (NO side of drawing 11 S7), a microprocessor 106 shifts actuation to step S11. On the other hand, when the selected image

data is plurality (YES side of drawing 11 S7), the spatial-frequency component of a high region chooses the thing of the large amplitude most in the image data which the microprocessor 106 chose (drawing 11 S8).

[0094] Here, when the number of the selected image data is one (NO side of drawing 11 S9), a microprocessor 106 shifts actuation to step S11. On the other hand, when the selected image data is still plurality (YES side of drawing 11 S9), a microprocessor 106 chooses what was photoed by the very first from the selected image data (drawing 11 S10).

[0095] Thus, after extracting image data to one, a microprocessor 106 performs picture compression to this image data through picture compression section 106a, and records it on a memory card 108 (drawing 11 S11). By actuation explained above, the spatial-frequency component of a high region chooses and records [from] the richest image data among the image data picturized continuously with the 4th operation gestalt. Therefore, it enables blurring, photographic subject Bure, focus gap, etc. to choose little [synthetically] image data appropriately.

[0096] In addition, with the 4th operation gestalt, although the spatial-frequency component of image data is judged to the precision using orthogonal transformation, such as DCT conversion, this invention is not limited to this. For example, it is easy to be natural even if it judges a spatial-frequency component simply using a well-known spatial filter (for example, high-pass filter, such as taking difference between contiguity pixels), contrast detection, etc. Next, another operation gestalt is explained.

[0097] (5th operation gestalt) The 5th operation gestalt is an operation gestalt corresponding to invention given in claims 1, 2, 8, and 9. In addition, about the configuration of the 5th operation gestalt, since it is almost the same as that of the 4th operation gestalt (drawing 10), configuration explanation here is omitted. Drawing 12 is a flow chart explaining actuation of the 5th operation gestalt.

[0098] Hereafter, actuation of the 5th operation gestalt is explained according to drawing 12 . First, if the main power supply of an electronic camera 101 is switched on, a microprocessor 106 will stand by until release ** 110 is pushed (NO side of drawing 12 S1). Here, if release ** 110 is pushed (YES side of drawing 12 S1), a microprocessor 106 will measure the strength of the light in photographic subject brightness through the photometry section 113, and will determine the exposure time for obtaining correct exposure (drawing 12 S2).

[0099] Next, a microprocessor 106 detects the focal distance of a zoom lens 102 through an encoder 115. Moreover, a microprocessor 106 detects photographic subject distance through the ranging section 114 (drawing 12 S3). Here, a microprocessor 106 judges whether the present mode setting is in flash photography mode (drawing 12 S4). Since fear of blurring or photographic subject Bure is low in the case of flash photography mode, a microprocessor 106 returns actuation to step S1, after performing the usual photography (recorded photography which carries out 1 coma image pick-up) (drawing 12 S5). On the other hand, when current mode setting is except flash photography mode, a microprocessor 106 performs the following condition distinction (1) and (2).

[0100] (1) When abortive (NO side of drawing 12 S6), after each of these conditions that (2) image scale factor (** focal distance / photographic subject distance) with the exposure time longer than predetermined time tau is larger than the predetermined scale factor gamma judges that a microprocessor 106 has little fear of blurring or photographic subject Bure and performs the usual photography (drawing 12 S5), they returns actuation to step S1.

[0101] On the other hand, when either of these conditions is also materialized (YES side of drawing 12 S6), a microprocessor 106 performs cure actuation after step S7. First, a microprocessor 106 directs the seriography for two or more sheets (three coma as [Here] an example) in the CCD drive circuit 112. The CCD drive circuit 112 reads the image data for three coma from an image sensor 103 one by one. The image data for these 3 coma is stored temporarily in an image memory 105, after chrominance-signal processing, a gamma correction, etc. are performed through the image-processing section 104 (drawing 12 S7).

[0102] Next, a microprocessor 106 directs picture compression to picture compression section 106a. Picture compression section 106a tries and compresses the image data of 1 coma eye, and in order to bring close to the desired amount of compression signs, it determines a suitable

scale factor (well-known parameter value which specifies the conditions of the quantization in picture compression). Picture compression section 106a uses the value of this scale factor uniformly, and carries out picture compression of the image data for three coma one by one (drawing 12 S8).

[0103] Here, about the image data of three coma, a microprocessor 106 carries out the size comparison of the amount of signs after compression (the amount of compression signs), and chooses most image data of the amount of compression signs (drawing 12 S9). Here, when the number of the selected image data is one (NO side of drawing 12 S10), a microprocessor 106 shifts actuation to step S12.

[0104] On the other hand, when the selected image data is plurality (YES side of drawing 12 S10), a microprocessor 106 chooses the image data photoed first in the selected image data (drawing 12 S11). Thus, after extracting image data to one, a microprocessor 106 records the selected image data (finishing [compression]) on a memory card 108 (drawing 12 S12).

[0105] With the 5th operation gestalt, among the image data picturized continuously, image data with many amounts of compression signs of No. 1 is chosen, and it records on a memory card 108 from from by actuation explained above. Therefore, the spatial-frequency component of a high region is the richest, and blurring, photographic subject Bure, and focus gap become possible [recording little / synthetically / image data on a memory card 108].

[0106] In addition, although it goes into the mode which chooses a good image (good image of a photography condition) with the 5th operation gestalt mentioned above if an image scale factor becomes larger than the predetermined scale factor gamma, it is not limited to this. For example, when a focal distance is longer than a predetermined value, you may make it go into the mode which chooses a good image. Moreover, with the 5th operation gestalt mentioned above, although picture compression of the image data of three coma is carried out over the screen whole region, this invention is not limited to this. For example, only the predetermined area in a screen (for example, middle of the screen) may be extracted from the image data of three coma, picture compression may be performed, and the amount of compression signs for evaluation may be calculated. In such actuation, the comparison of a spatial-frequency component is performed only within the inside of predetermined area. therefore, looking-far photography — passing — photographing — etc. — even if it is in photography conditions on which a background fades, it becomes possible to choose the clear image data in predetermined area exactly. moreover, since in calculating the amount of compression signs for evaluation it is sufficient if picture compression only of the inside of predetermined area is carried out, it becomes possible to boil markedly the processing time for calculating the amount of compression signs for evaluation, and to shorten it.

[0107] Furthermore, although the picture compression for three coma is started with the 5th operation gestalt mentioned above after completing all the seriographies for three coma, this invention is not limited to this. For example, of course, it does not matter by performing picture compression of a last coma, and image pick-up actuation of degree coma to a concurrency even if it increases the photography number of sheets per unit time amount. Especially, in such actuation, since it becomes possible to perform the old and new comparison of the amount of compression signs to image pick-up actuation and a concurrency, it becomes possible like invention according to claim 6 to constitute the electronic camera of the gestalt which carries out overwrite record of the better image data.

[0108] In addition, although the 1-5th operation gestalten mentioned above explained the case where the good image of one sheet was saved, it is also possible to apply this invention to the case where the good image of two or more sheets is saved. For example, in the case of exposure bracketing (mode photoed several sheets while changing exposure conditions), the actuation which saves the good image of one sheet under the same exposure conditions should just be repeated, changing exposure conditions.

[0109] Moreover, although especially the 1-5th operation gestalten mentioned above do not explain the display function of an electronic camera, it is possible to perform various displays in relation to this invention. For example, in the monitor display of an electronic camera, or a finder, the mode display in "the mode which chooses an image according to quality evaluation of a photography condition" may be performed, and the current sample size of image data and the

remaining sample sizes may be displayed using a picture, an alphabetic character, etc. With such a configuration, it becomes possible to tell the operating state of an electronic camera in detail to a photography person.

[0110] In addition, the results (magnitude of the amount of Bure etc.) of quality evaluation of a photography condition may be displayed using a picture, an alphabetic character, etc. At this time, the image data in temporary storage may be displayed together with the display of quality evaluation (for example, thumbnail display). With such a configuration, it becomes possible, after a photography person takes into consideration the display of an image, and the display of quality evaluation to choose desired image data suitably. Moreover, if quality evaluation of a photography condition becomes below a threshold, an alarm display (an alarm etc. is included) may be performed, and the display (an alarm etc. is included) which tells that quality evaluation became the maximum may be performed. With such a configuration, since the quality of a photography condition is fed back to a photography person, it becomes possible to lead to a better photography condition.

[0111] In addition, with the operation gestalt mentioned above, although the electronic camera of a simple substance configuration was explained, this invention is not limited to this. For example, it is also possible to apply this invention to an image pick-up unit and information machines and equipment (computer etc.) at the electronic camera by which the separation configuration was carried out. As an example in that case, the image data which carried out the seriography by (1) image-pick-up unit side is stored temporarily. (2) By the program execution by the side of a computer, the assignment of carrying out selection preservation of the image according to quality evaluation of a photography condition out of the image data of these single strings of operation can be considered.

[0112] Furthermore, when expanding the applicability of this invention even to a computer, "the image selection program which carries out selection preservation of the image according to quality evaluation of a photography condition out of a series of image data" may be independently executed by the computer side. Of course, although demerits, such as becoming inadequate, also have information gathering of the photography condition from a camera side with such a configuration, since a computer simple substance can also be carried out if it is quality evaluation of a spatial-frequency component, it becomes possible to acquire the operation effectiveness about homogeneous as the configuration of this invention.

[0113]

[Effect of the Invention]

(Claim 1) In invention according to claim 1, a photography condition chooses from from the image data picturized at the best period among the image data picturized continuously. Therefore, it becomes possible to obtain the good image data of a photography condition, without using no conventional blurring amendment device etc.

[0114] Therefore, it becomes possible to exclude the optical system for the conventional blurring amendment, and a miniaturization and lightweight-izing of a taking lens can be attained. It becomes possible to exclude the tooth space for moreover arranging the optical system for blurring amendment from the inside of a taking lens. Consequently, the degree of freedom on an optical design becomes high, and becomes possible [optimizing the aberration engine performance of a taking lens etc. reasonable].

[0115] Moreover, the slight internal reflection produced in the optical system for the conventional blurring amendment is also canceled. Therefore, the flare at the time of backlight photography can mitigate, and image pick-up image quality can be raised further. It becomes possible moreover to exclude the drive for the conventional blurring amendment etc., and power-saving of an electronic camera can be attained. Furthermore, the fault that the noise and vibration arise from the drive for blurring amendment is also canceled. Moreover, since selection processing of image data is performed after the completion of photography, the processing burden during a photography period does not increase so much, but also produces the advantage that the photography number of sheets per unit time amount does not decrease so much.

[0116] (Claim 2) In invention according to claim 2, a temporary storage means starts the temporary storage of image data after release actuation of an electronic camera. Therefore, if it

is before release actuation, it becomes possible to stop image pick-up actuation. Therefore, power-saving of an electronic camera can be attained.

[0117] (Claim 3) In invention according to claim 3, a temporary storage means holds the image data over release actuation order. Therefore, it becomes possible to choose the better image data of a photography condition from the period not only before and after the image data after release actuation but release actuation exactly.

[0118] Moreover, in just before release actuation, blurring accompanying release actuation has not arisen yet. Therefore, in evaluating blurring as a photography condition, it becomes possible by adding during the direct first half of release actuation to the sample section of image data to choose very little image data of blurring by the high probability. Since the sample section of image data is moreover allotted ranging over release actuation order, compared with the case where the sample section of the same time amount length is allotted after release actuation, the worst value (it corresponds to the endpoint of the sample section of image data) of release time lag can be mostly reduced by half.

[0119] (Claim 4) In invention according to claim 4, a temporary storage means and an image preservation means make the same storage serve a double purpose. Therefore, it is not necessary to have the storage of dedication for a temporary storage means, and the configuration of an electronic camera can be simplified.

[0120] (Claim 5) the image data continuously picturized in invention according to claim 5 — difference — after compressing, it stores temporarily. Therefore, it becomes possible to stop the amount of signs of image data small, and storage capacity of a temporary storage means can be made small as much as possible. Moreover, when not changing memory capacity of a temporary storage means, it becomes possible to increase the sample size of the image data in which temporary storage is possible. In this case, since selection is performed more out of many image data, possibility of obtaining image data with a more good photography condition becomes high much more.

[0121] (Claim 6) In invention according to claim 6, it leaves alternatively image data with a more sufficient photography condition from among the image data picturized one after another. Therefore, the good image data of a photography condition can be obtained, without using no blurring amendment device like before etc. Moreover, since overwrite record of the image data will be carried out, if a storage has the capacity which memorizes the image data for at least one sheet, it is sufficient for it. Therefore, it is not necessary to equip temporary storage with a mass storage, and the configuration of an electronic camera can be simplified.

[0122] (Claim 7) In invention according to claim 7, the amount of Bure of an image pick-up means is detected as quality evaluation of a photography condition. Consequently, it becomes possible to choose image data with little blurring appropriately, and to save it.

[0123] (Claim 8) In invention according to claim 8, the spatial-frequency component of image data is used as criteria of quality evaluation of a photography condition. Consequently, it enables them for blurring, photographic subject Bure, focus gap, etc. to choose little [synthetically] image data appropriately, and to save it. Since especially quality evaluation of such a spatial-frequency component can be performed by count, the piezo-electric gyroscope for blurring detection etc. becomes unnecessary. Therefore, even if it adopts invention according to claim 8, there is especially no need of adding sensor components etc. to an electronic camera from old, and it becomes possible to acquire the effectiveness of this invention with low cost and a simple configuration.

[0124] Moreover, especially about the photographic subject in which the motion which cannot be predicted is shown like the flower which shakes to a wind, it is only the usual AF (automatic focusing) photography, and it becomes very difficult to prevent focus gap completely. However, under such an ill condition, based on a spatial-frequency component, image data with little focus gap can be chosen certainly, and can be saved in invention according to claim 8.

[0125] (Claim 9) In invention according to claim 9, the amount of high-frequency components of spatial frequency is judged from the amount of compression signs. Since the value of such an amount of compression signs can be acquired from the result of the picture compression processing from old etc., it does not need to add special data processing and becomes possible [aiming at mitigation of the amount of data processing, or the processing time].

[0126] (Claim 10) In invention according to claim 10, release time lag is used as one of the quality evaluations of a photography condition. Consequently, it becomes possible to choose and save comparatively little good image data of release time lag. In a case which chooses image data with little release time lag from before release actuation in the condition of storing the image pick-up image temporarily, especially, it enables release time lag to obtain the image data very near zero.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a principle block diagram explaining invention according to claim 1.

[Drawing 2] It is a principle block diagram explaining invention according to claim 6.

[Drawing 3] It is the block diagram showing the 1st operation gestalt.

[Drawing 4] It is a flow chart explaining actuation of the 1st operation gestalt.

[Drawing 5] It is drawing having shown time amount change of the amount of Bure.

[Drawing 6] It is the block diagram showing the 2nd operation gestalt.

[Drawing 7] It is a flow chart explaining actuation of the 2nd operation gestalt.

[Drawing 8] It is the block diagram showing the 3rd operation gestalt.

[Drawing 9] It is a flow chart explaining actuation of the 3rd operation gestalt.

[Drawing 10] It is the block diagram showing the 4th operation gestalt.

[Drawing 11] It is a flow chart explaining actuation of the 4th operation gestalt.

[Drawing 12] It is a flow chart explaining actuation of the 5th operation gestalt.

[Drawing 13] It is drawing showing the conventional example of a camera with a blurring amendment device.

[Description of Notations]

1 Image Pick-up Means

2 Temporary Storage Means

3 Photography Evaluation Means

4 Static-Image Selection Means

5 Image Preservation Means

10 Storage

11 Comparison Means

12 Image Overwrite Means

21, 41, 61, 91,101 Electronic camera

22, 42, 62, 92 Taking lens

23, 43, 63,103 Image sensor

24, 44, 64,104 Image-processing section

25, 45, 66,105 Image memory

26, 46, 65,106 Microprocessor

29a, 49a, 69a The amount detection sensor of Bure

29b, 49b, 69b The amount detection sensor of Bure

30, 50, 70,110 Release **

31, 51, 71,112 CCD drive circuit

32 52 Timer

33 Infrared Transfer Interface

47 67 Image recording section

48 68 Memory card

93 Bure Amendment Optical System

94 Coreless Motor

95 Coreless Motor

96 The Amount Detection Sensor of Bure

http://www4.ipdl.ncipi.go.jp/cgi-bin/tran_web_cgi_ejje

97 The Amount Detection Sensor of Bure
102 Zoom Lens
106a Picture compression section
111 Photography Mode Selector Button
113 Photometry Section
114 Ranging Section
115 Encoder
116 Flash Section

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

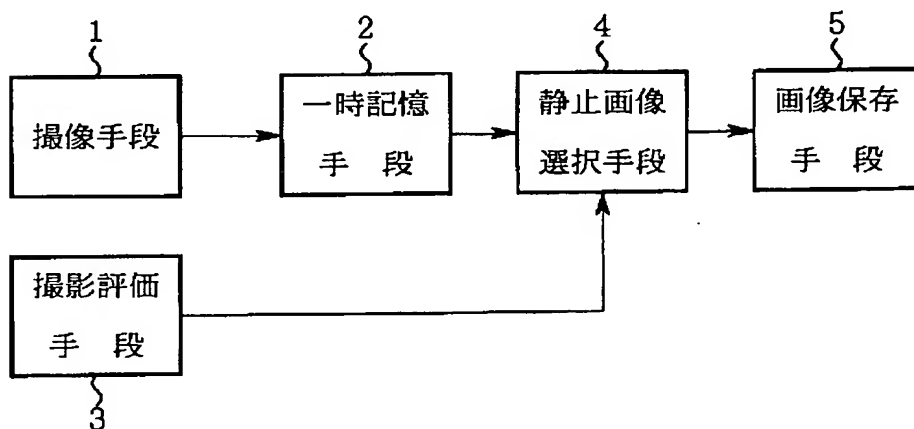
2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DRAWINGS

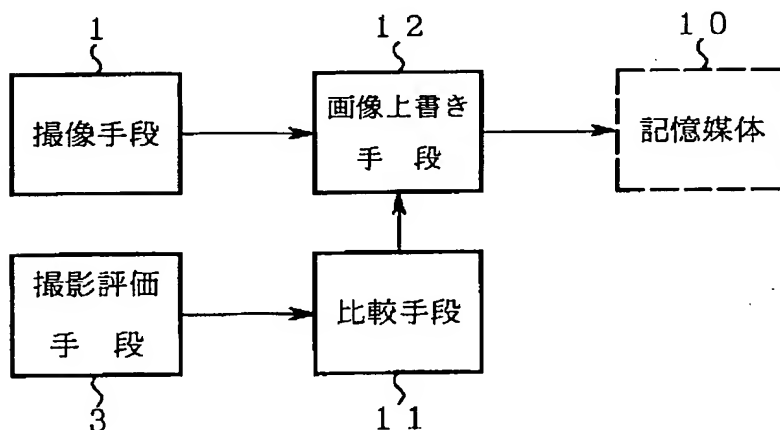
[Drawing 1]

請求項 1 に記載の発明を説明する原理ブロック図

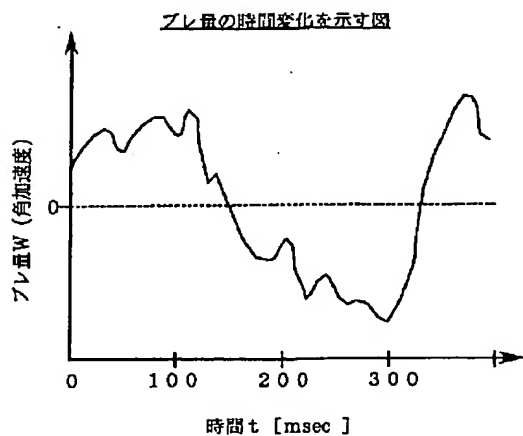


[Drawing 2]

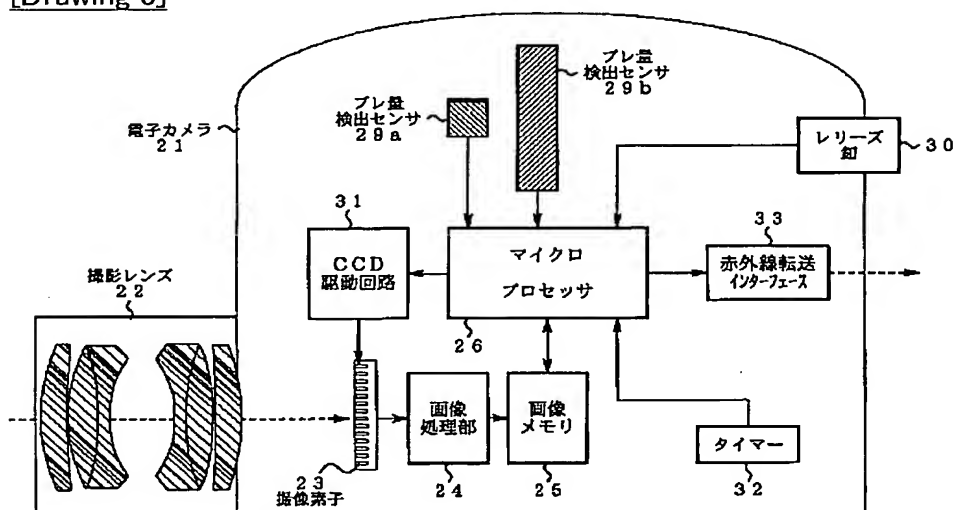
請求項 6 に記載の発明を説明する原理ブロック図



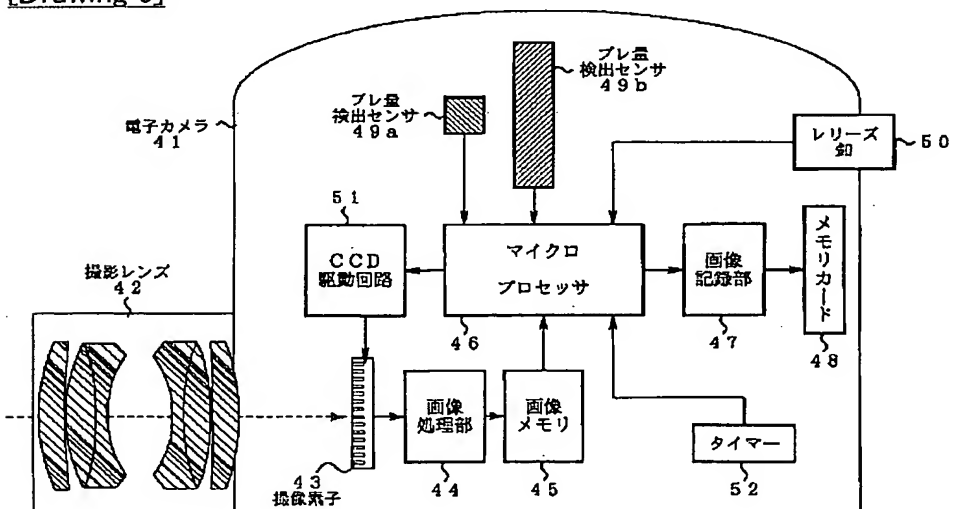
[Drawing 5]



[Drawing 3]

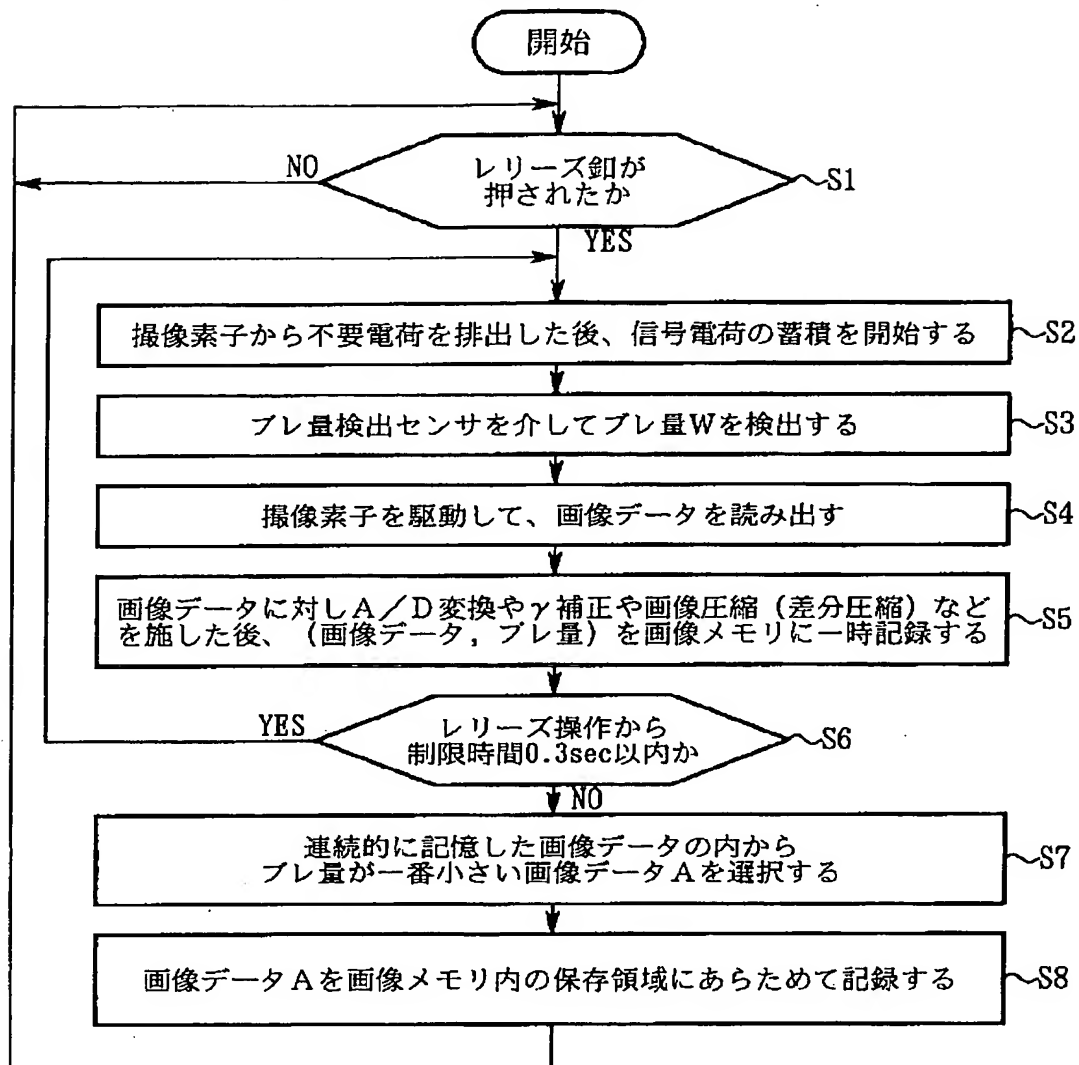


[Drawing 6]



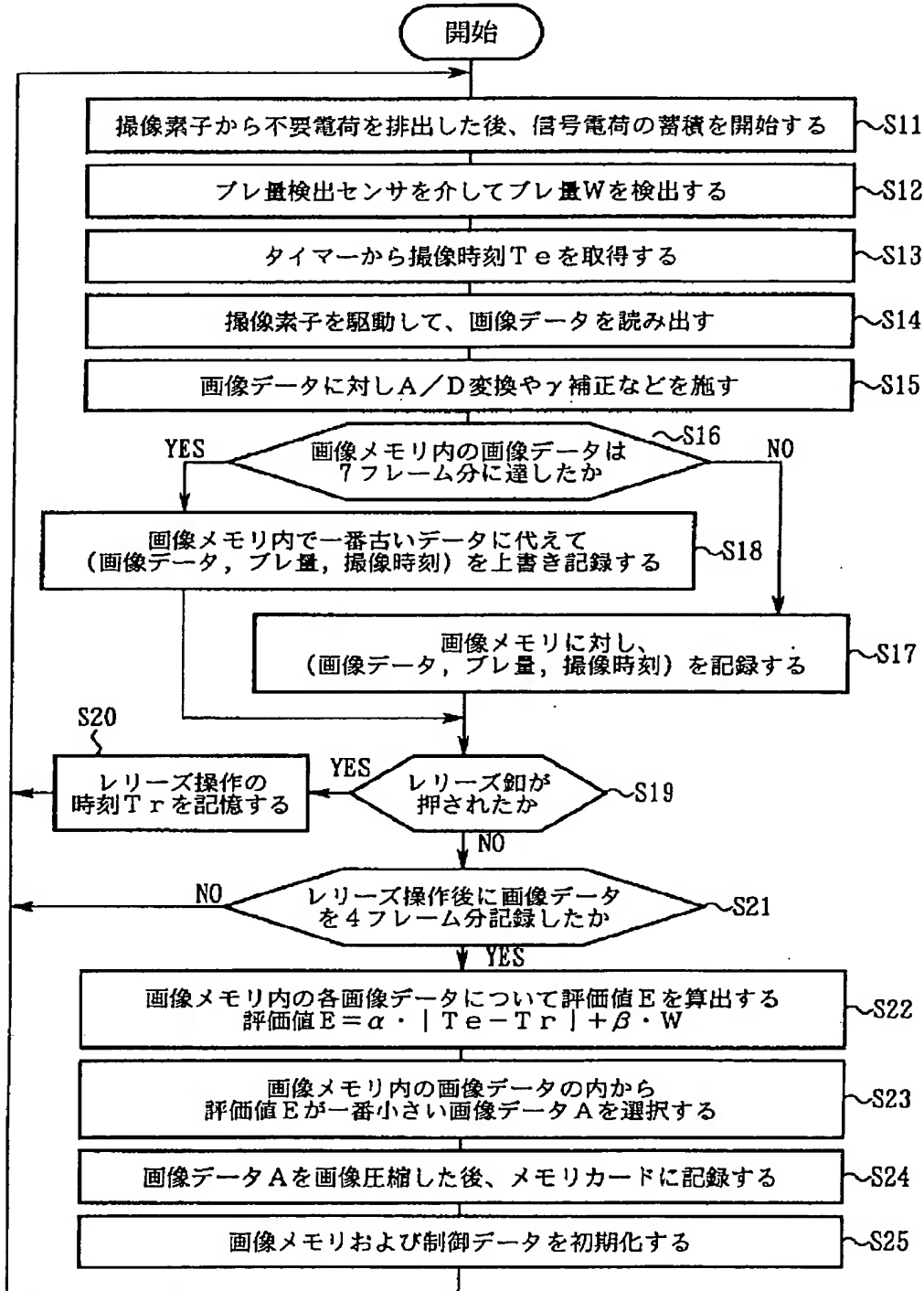
[Drawing 4]

第 1 の実施形態の動作を説明する流れ図

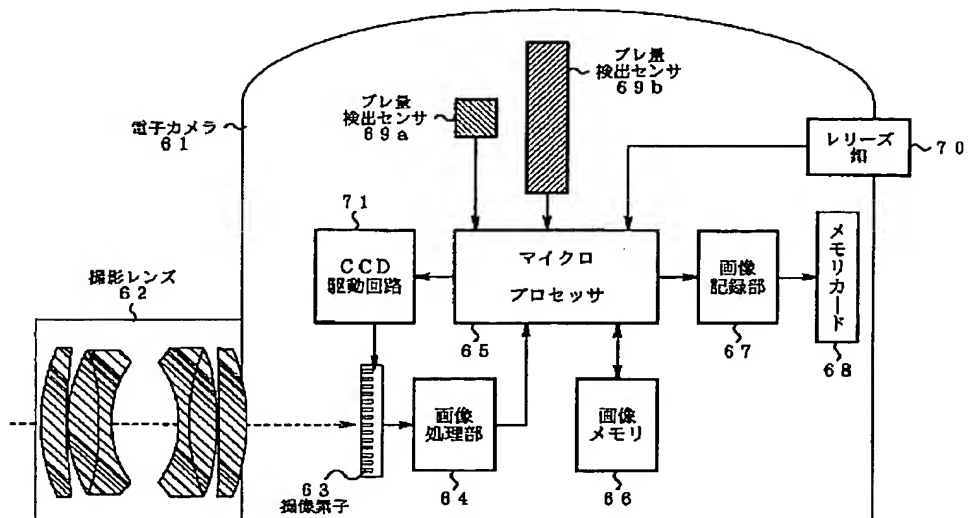


[Drawing 7]

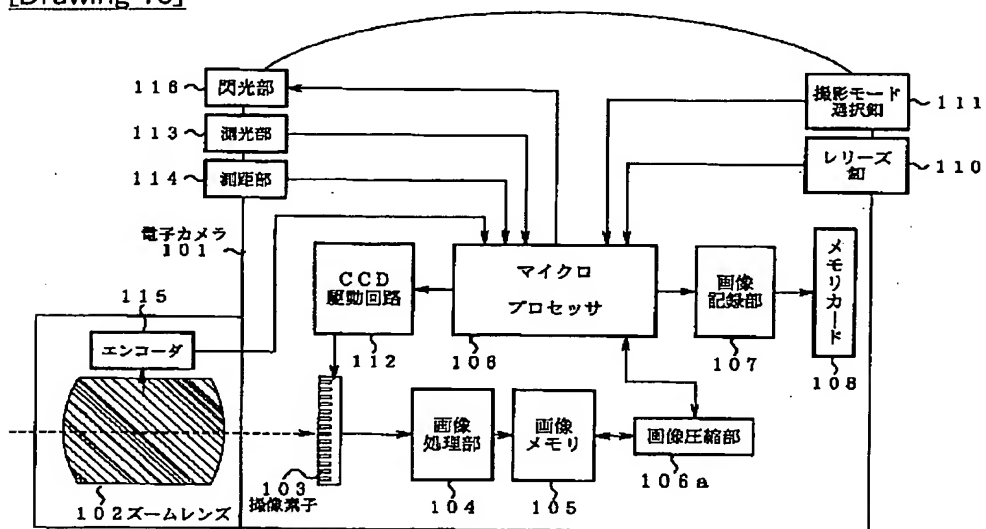
第2の実施形態の動作を説明する流れ図



[Drawing 8]

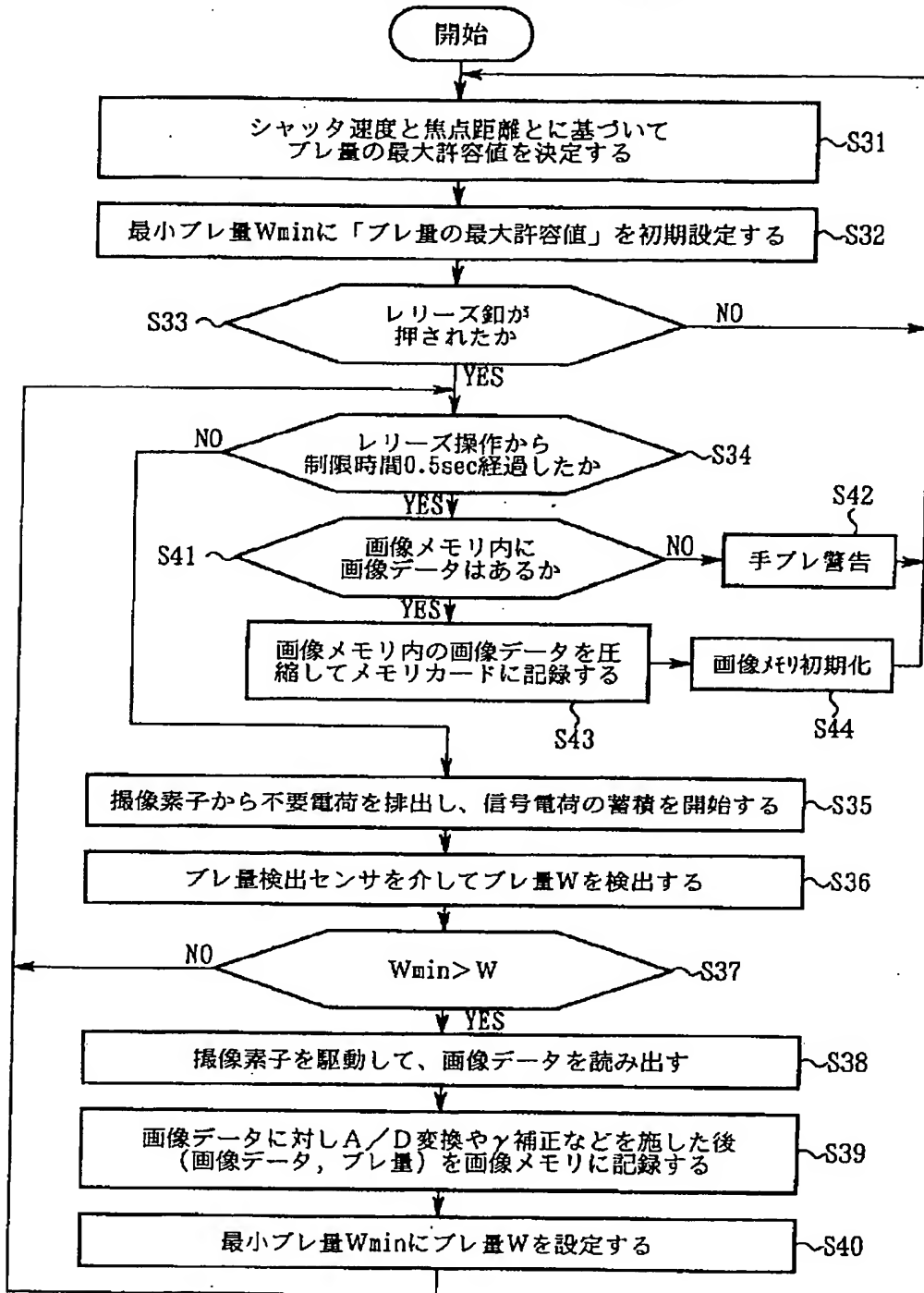


[Drawing 10]



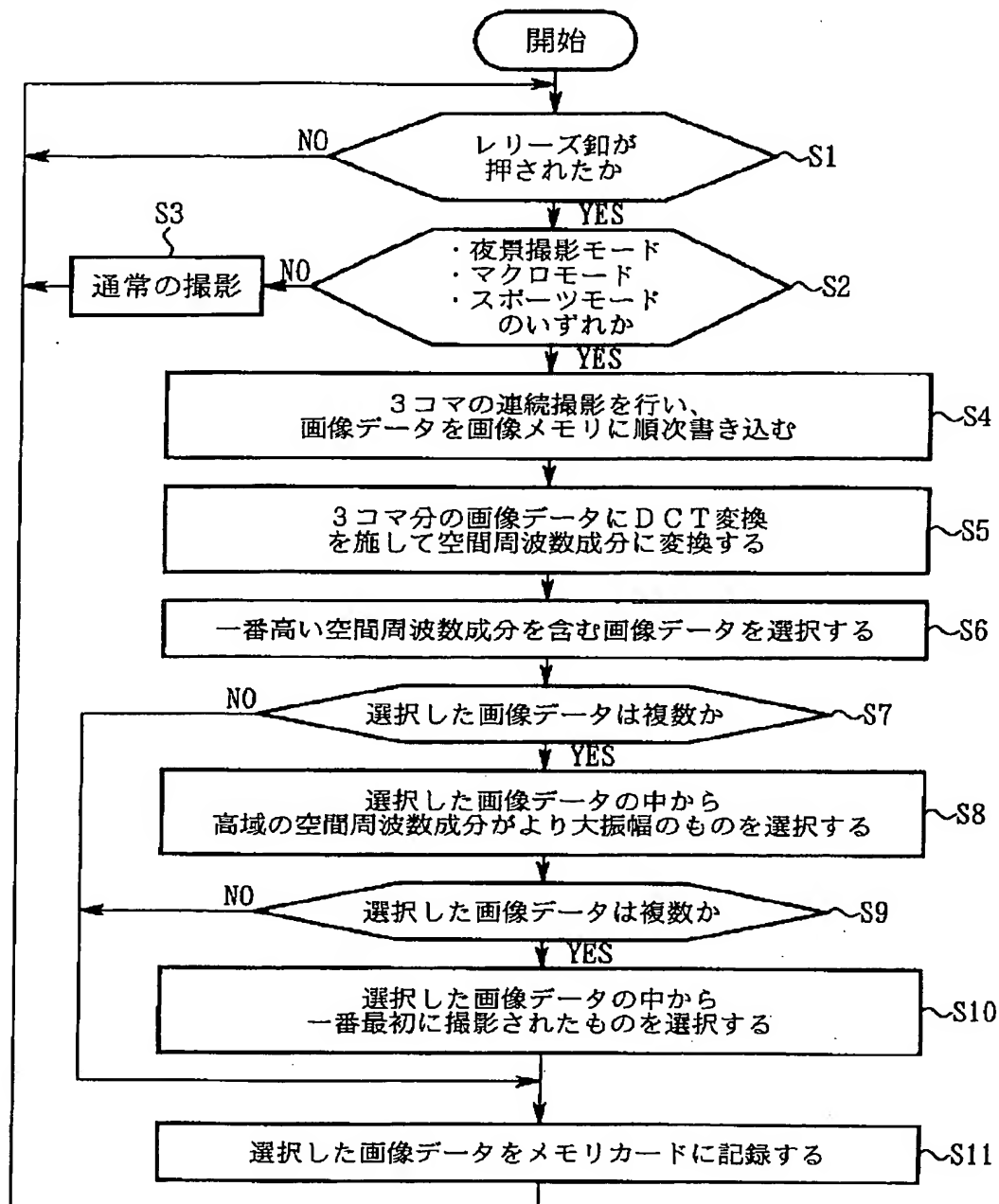
[Drawing 9]

第3の実施形態の動作を説明する流れ図



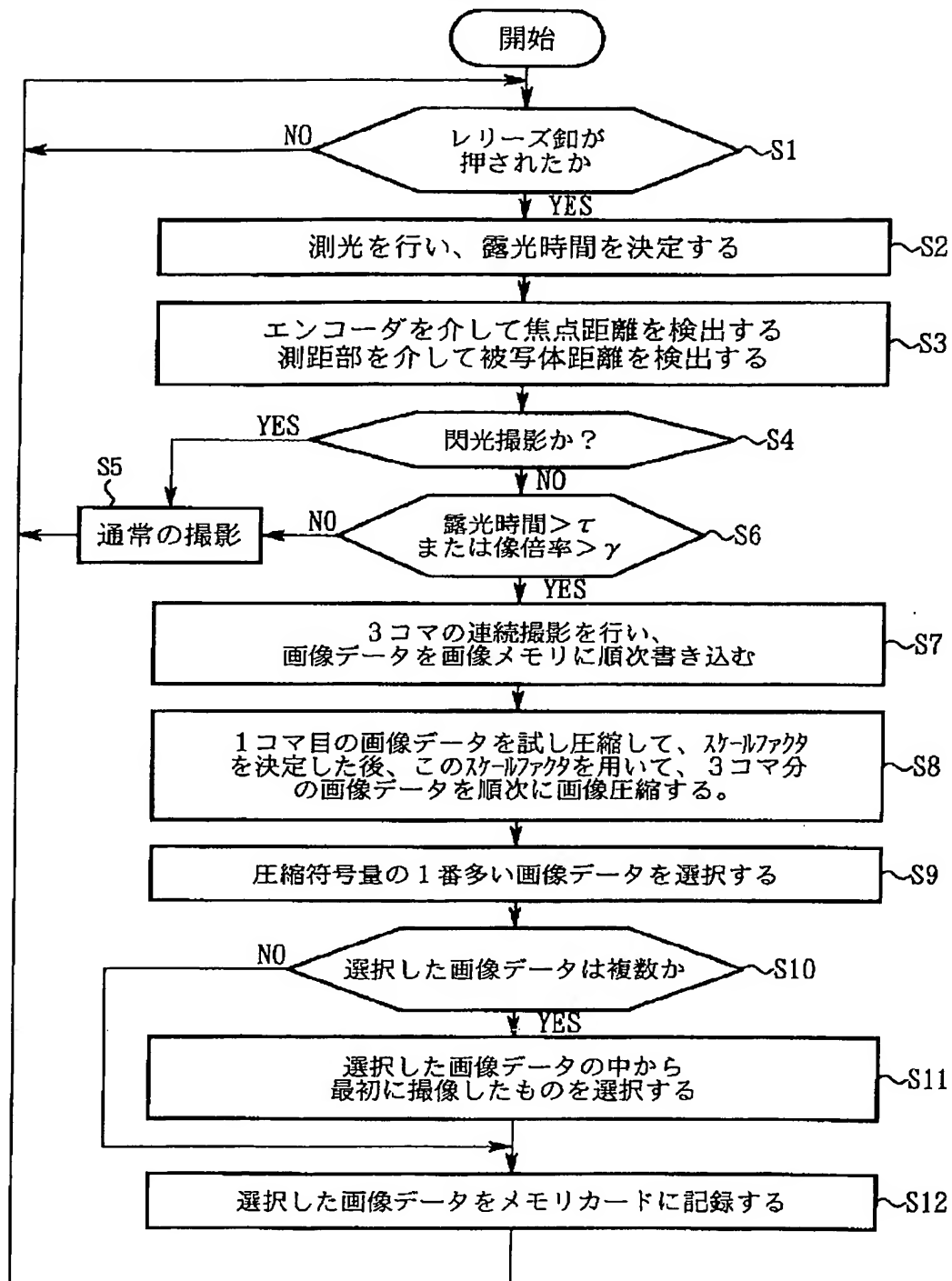
[Drawing 11]

第4の実施形態の動作を説明する流れ図



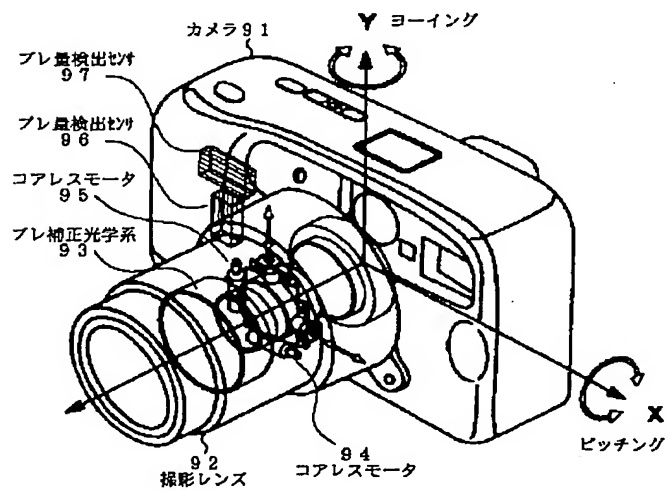
[Drawing 12]

第5の実施形態の動作を説明する流れ図



[Drawing 13]

手ブレ補正機構付きのカメラの従来例を示す図



[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law

[Section partition] The 3rd partition of the 7th section

[Publication date] November 24, Heisei 17 (2005. 11.24)

[Publication No.] JP, 11-136557, A

[Date of Publication] May 21, Heisei 11 (1999. 5.21)

[Application number] Japanese Patent Application No. 10-236102

[The 7th edition of International Patent Classification]

H04N 5/225

H04N 5/91

[FI]

H04N 5/225 F

H04N 5/91 J

[Procedure revision]

[Filing Date] October 5, Heisei 17 (2005. 10.5)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] Claim

[Method of Amendment] Modification

[The contents of amendment]

[Claim(s)]

[Claim 1] An image pick-up means to picturize a photographic subject continuously,

A temporary storage means to store temporarily the image data of two or more sheets continuously picturized by said image pick-up means,

A photography evaluation means to calculate the amount of compression signs about the image data picturized by said image pick-up means, and to evaluate the quality of a photography condition based on said amount of compression signs,

A static-image selection means by which evaluation of said photography evaluation means chooses the highest image data from among the image data memorized by said temporary storage means,

An image preservation means to save the image data chosen by said static-image selection means

The electronic camera characterized by preparation *****.

[Claim 2] In an electronic camera according to claim 1,

Said temporary storage means,

The temporary storage of image data is started after release actuation of an electronic camera.

The electronic camera characterized by things.

[Claim 3] In an electronic camera according to claim 1,

Said temporary storage means,

In the standby condition of release actuation, new image data is incorporated one by one from said image pick-up means, and renewal of sequential of the image data in temporary storage is carried out,

When after release actuation of an electronic camera stores temporarily the image data over release actuation order, it stops renewal of data.

The electronic camera characterized by things.

[Claim 4] In an electronic camera given in any 1 term of claim 1 thru/or claim 3,

The storage with same said temporary storage means and said image preservation means is made to serve a double purpose.

The electronic camera characterized by things.

[Claim 5] In an electronic camera given in any 1 term of claim 1 thru/or claim 4,

Said temporary storage means,

the image data of two or more sheets continuously picturized by said image pick-up means — difference — it is a means to compress and memorize

The electronic camera characterized by things.

[Claim 6] An image pick-up means to picturize a photographic subject continuously,

The storage which can memorize image data,

A photography evaluation means to calculate the amount of compression signs about each image data picturized by said image pick-up means, and to evaluate the quality of a photography condition based on the amount of compression signs,

A comparison means to compare evaluation of said photography evaluation means about the image data in said storage with evaluation of said photography evaluation means about the new image data from said image pick-up means,

The image overwrite means which carries out overwrite record of the image data new to said storage by the old and new comparison of said comparison means when evaluation of new image data is high

The electronic camera characterized by preparation *****.

[Claim 7] An image pick-up means to picturize a photographic subject continuously,

A temporary storage means to store temporarily the image data of two or more sheets continuously picturized by said image pick-up means,

A photography evaluation means to judge a spatial-frequency component about the image data picturized by said image pick-up means, and to evaluate the quality of a photography condition,

A static-image selection means by which evaluation of said photography evaluation means chooses the highest image data from among the image data memorized by said temporary storage means,

An image preservation means to save the image data chosen by said static-image selection means

The electronic camera characterized by preparation *****.

[Claim 8] In an electronic camera given in any 1 term of claims 1, 6, and 7,

Said photography evaluation means,

The judgment of the release time lag which is the time amount gap with the electronic camera release actuation—and image pick-up time of image data is added to quality evaluation of said photography condition.

The electronic camera characterized by things.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Modification

[The contents of amendment]

[0009]

So, in this invention, in order to solve an above-mentioned trouble, it aims at offering the electronic camera which can obtain the good image data of a photography condition certainly. Especially, it aims at offering the electronic camera which can attain power-saving in invention according to claim 2.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Modification

[The contents of amendment]

[0011]

It aims at offering the electronic camera which can exclude a temporary storage means (after-mentioned) in invention according to claim 6.

It aims at offering the electronic camera which can obtain good image data with little photographic subject Bure and focus gap in invention according to claim 7.

It aims at offering the electronic camera which can analyze a spatial-frequency component efficiently in invention according to claim 1.

Release time lag aims at offering the electronic camera which can obtain small good image data in invention according to claim 8.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0012

[Method of Amendment] Modification

[The contents of amendment]

[0012]

[Means for Solving the Problem]

(Claim 1)

Drawing 1 is an outline block diagram for explaining invention according to claim 1.

Written this invention is characterized by providing the following in invention at claim 1. An image pick-up means 1 to picturize a photographic subject continuously A temporary storage means 2 to store temporarily the image data of two or more sheets continuously picturized by the image pick-up means 1 A photography evaluation means 3 to calculate the amount of compression signs about the image data picturized by the image pick-up means 1, and to evaluate the quality of a photography condition based on the amount of compression signs An image preservation means 5 to save from from the image data as which it was chosen by static-image selection means 4 to choose image data with the highest evaluation of the photography evaluation means 3, and the static-image selection means 4 among the image data memorized by the temporary storage means 2

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0017

[Method of Amendment] Modification

[The contents of amendment]

[0017]

(Claim 6)

Drawing 2 is an outline block diagram for explaining invention according to claim 6.

An image pick-up means 1 by which invention according to claim 6 picturizes a photographic subject continuously, The storage 10 which can memorize image data, and a photography evaluation means 3 to calculate the amount of compression signs about each image data picturized by the image pick-up means 1, and to evaluate the quality of a photography condition based on the amount of compression signs, A comparison means 11 to compare evaluation of the photography evaluation means 3 about the image data in a storage 10 with evaluation of the photography evaluation means 3 about the new image data from the image pick-up means 1, It is characterized by having the image overwrite means 12 which carries out overwrite record of the image data new to a storage 10 by the comparison of the comparison means 11 when evaluation of new image data is high.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0018

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0019

[Method of Amendment] Modification

[The contents of amendment]

[0019]

(Claim 7)

Invention according to claim 7 is characterized by replacing the photography evaluation means 3 with the amount of compression signs, and judging the spatial-frequency component of image data.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0020

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 9]

[Document to be Amended] Specification

[Item(s) to be Amended] 0021

[Method of Amendment] Modification

[The contents of amendment]

[0021]

(Claim 8)

In an electronic camera given in any 1 term of claims 1, 6, and 7, as for invention according to claim 8, the photography evaluation means 3 is characterized by adding the judgment of the release time lag which is the time amount gap with the electronic camera release actuation-and image pick-up time of image data at quality evaluation of a photography condition.

[Procedure amendment 10]

[Document to be Amended] Specification

[Item(s) to be Amended] 0022

[Method of Amendment] Modification

[The contents of amendment]

[0022]

Operation explanation [for <<each claim of every >>]>>

In the electronic camera in connection with claim 1, the image pick-up means 1 picturizes a photographic subject image continuously. Thus, the picturized image data of two or more sheets is stored temporarily for the temporary storage means 2.

On the other hand, the photography evaluation means 3 evaluates the quality of a photography condition based on the amount of compression signs about each image data. The static-image selection means 4 chooses from the image data by which evaluation of this photography condition was picturized at the highest period among the image data memorized by the temporary storage means 2. The image preservation means 5 saves this selected image data.

[Procedure amendment 11]

[Document to be Amended] Specification

[Item(s) to be Amended] 0023

[Method of Amendment] Modification

[The contents of amendment]

[0023]

By the above actuation, the good image data of a photography condition can be alternatively obtained with the electronic camera of claim 1.

[Procedure amendment 12]

[Document to be Amended] Specification

[Item(s) to be Amended] 0030

[Method of Amendment] Modification

[The contents of amendment]

[0030]

In the electronic camera in connection with claim 6, the image pick-up means 1 picturizes a photographic subject image continuously. At this time, the photography evaluation means 3 evaluates the quality of a photography condition based on the amount of compression signs. The comparison means 11 compares the evaluation about the image data in a storage 10 with the new evaluation about the new image data from the image pick-up means 1.

Here, when the new evaluation is higher, the image overwrite means 12 carries out overwrite record of the image data new to a storage 10. Consequently, the better image data of a photography condition will remain in a storage 10.

Especially, it is not necessary to store temporarily all a series of image data, and a mass temporary storage means etc. becomes unnecessary in the electronic camera of claim 6.

[Procedure amendment 13]

[Document to be Amended] Specification

[Item(s) to be Amended] 0031

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 14]

[Document to be Amended] Specification

[Item(s) to be Amended] 0032

[Method of Amendment] Modification

[The contents of amendment]

[0032]

In the electronic camera in connection with claim 7, the spatial-frequency component of image data is used as a scale of quality evaluation of a photography condition. Usually, the image data picturized continuously does not change the pattern itself so much, but it is assumed that distribution of spatial frequency is almost eternal. However, if blurring, photographic subject Bure, focus gap, etc. arise in these image data, image data will be graduated by it and the spatial-frequency component of a high region will be harmed.

[Procedure amendment 15]

[Document to be Amended] Specification

[Item(s) to be Amended] 0034

[Method of Amendment] Modification

[The contents of amendment]

[0034]

In the electronic camera in connection with claim 1, the spatial-frequency component of image data is judged from the amount of compression signs. Usually, it can be judged that there are many spatial-frequency components of a high region, so that there are many amounts of compression signs. Therefore, in the image data picturized continuously, there is less what has more amounts of compression signs synthetically, and blurring, photographic subject Bure, and focus gap can estimate it that a photography condition is better.

[Procedure amendment 16]

[Document to be Amended] Specification

[Item(s) to be Amended] 0035

[Method of Amendment] Modification

[The contents of amendment]

[0035]

In the electronic camera in connection with claim 8, release time lag is detected as at least one of the quality evaluations of a photography condition. It can be estimated that near and a photography condition are better to the shutter timing which a photography person means, so that there is little this release time lag.

Thus, it becomes possible by considering as one item of quality evaluation of release time lag to choose image data with more little release time lag.

[Procedure amendment 17]

[Document to be Amended] Specification

[Item(s) to be Amended] 0036

[Method of Amendment] Deletion
[The contents of amendment]
[Procedure amendment 18]
[Document to be Amended] Specification
[Item(s) to be Amended] 0037
[Method of Amendment] Modification
[The contents of amendment]
[0037]

In addition, in the explanation of claims 1, 6, and 7 mentioned above, on account of explanation, although it says that quality evaluation is performed only by one evaluation criteria, the contents of invention are not limited to this.

What may carry out to the evaluation criteria of these plurality by establishing priority, carries out weighting to evaluation criteria, and performs synthetic evaluation is easy to be natural [quality evaluation]. Of course at this time, it does not matter even if evaluation criteria other than claims 1, 6, and 7 and 8 are contained.

[Procedure amendment 19]
[Document to be Amended] Specification
[Item(s) to be Amended] 0038
[Method of Amendment] Modification
[The contents of amendment]
[0038]

Moreover, the electronic camera in claims 1–8 mentioned above is not narrowly limited to the electronic camera of a simple substance configuration. An electronic camera in recent years is in the inclination constituted by an image pick-up unit and information machines and equipment (a computer, electronic notebook, etc.) as systems of two or more set machine — a separation configuration is carried out. In such a system configuration, it becomes possible to share actuation of this invention suitably between two or more set machines.

[Procedure amendment 20]
[Document to be Amended] Specification
[Item(s) to be Amended] 0041
[Method of Amendment] Modification
[The contents of amendment]
[0041]

(1st operation gestalt)

Drawing 3 is the block diagram showing the 1st operation gestalt.

A taking lens 22 is attached in the front face of an electronic camera 21 in drawing 3. The light-receiving side of an image sensor 23 is arranged at the image space side of this taking lens 22.

[Procedure amendment 21]
[Document to be Amended] Specification
[Item(s) to be Amended] 0044
[Method of Amendment] Deletion
[The contents of amendment]
[Procedure amendment 22]
[Document to be Amended] Specification
[Item(s) to be Amended] 0055
[Method of Amendment] Modification
[The contents of amendment]
[0055]

(2nd operation gestalt)

Drawing 6 is the block diagram showing the 2nd operation gestalt.

A taking lens 42 is attached in the front face of an electronic camera 41 in drawing 6. The light-receiving side of an image sensor 43 is arranged at the image space side of this taking lens 42.

[Procedure amendment 23]
[Document to be Amended] Specification
[Item(s) to be Amended] 0058

[Method of Amendment] Modification

[The contents of amendment]

[0058]

Moreover, the control signal of the electronic shutter from a microprocessor 46 is given to the CCD drive circuit 51. The CCD drive circuit 51 generates a driving pulse according to this control signal, and gives it to an image sensor 43. In addition, a timer 52 is connected to a microprocessor 46.

[Procedure amendment 24]

[Document to be Amended] Specification

[Item(s) to be Amended] 0069

[Method of Amendment] Modification

[The contents of amendment]

[0069]

(3rd operation gestalt)

Drawing 8 is the block diagram showing the 3rd operation gestalt.

A taking lens 62 is attached in the front face of an electronic camera 61 in drawing 8. The light-receiving side of an image sensor 63 is arranged at the image space side of this taking lens 62.

[Procedure amendment 25]

[Document to be Amended] Specification

[Item(s) to be Amended] 0072

[Method of Amendment] Modification

[The contents of amendment]

[0072]

Moreover, the control signal of the electronic shutter from a microprocessor 65 is given to the CCD drive circuit 71. The CCD drive circuit 71 generates a driving pulse according to this control signal, and gives it to an image sensor 63.

[Procedure amendment 26]

[Document to be Amended] Specification

[Item(s) to be Amended] 0083

[Method of Amendment] Modification

[The contents of amendment]

[0083]

In addition, with the 3rd operation gestalt, although it has left image data with more few amounts of Bure to the image memory 66 based on the comparison of the amount of Bure, it is not limited to this. The image data which it leaves to an image memory 66 on the basis of the evaluation value containing the evaluation criteria of claims 1, 6, 7, and 8 etc. may be chosen. Moreover, although no image data is recorded with the 3rd operation gestalt when the amount W of Bure is not less than "the maximum allowed value of the amount of Bure", it is not limited to this. For example, the first image data etc. is recorded for the time being, and whenever the amount W of Bure is less, you may make it update image data about it or subsequent ones. Finally with such a configuration, the amount W of Bure can record the smallest image data.

[Procedure amendment 27]

[Document to be Amended] Specification

[Item(s) to be Amended] 0085

[Method of Amendment] Modification

[The contents of amendment]

[0085]

(4th operation gestalt)

Drawing 10 is the block diagram showing the 4th operation gestalt.

A zoom lens 102 is attached in the front face of an electronic camera 101 in drawing 10. The light-receiving side of an image sensor 103 is arranged at the image space side of this zoom lens 102.

[Procedure amendment 28]

[Document to be Amended] Specification

[Item(s) to be Amended] 0088

[Method of Amendment] Modification

[The contents of amendment]

[0088]

In addition, the flash section (the so-called stroboscope) 116 is formed in the encoder 115 and list which detect a focal distance from the photometry section 113 which measures the strength of the light in photographic subject brightness, the ranging section 114 which measures photographic subject distance, and a lens location, and it connects with an electronic camera 101 at a microprocessor 106, respectively.

[Procedure amendment 29]

[Document to be Amended] Specification

[Item(s) to be Amended] 0097

[Method of Amendment] Modification

[The contents of amendment]

[0097]

(5th operation gestalt)

About the configuration of the 5th operation gestalt, since it is almost the same as that of the 4th operation gestalt (drawing 10), configuration explanation here is omitted.

Drawing 12 is a flow chart explaining actuation of the 5th operation gestalt.

[Procedure amendment 30]

[Document to be Amended] Specification

[Item(s) to be Amended] 0113

[Method of Amendment] Modification

[The contents of amendment]

[0113]

[Effect of the Invention]

(Claim 1)

In invention according to claim 1, the image data by which the photography condition was picturized at the best period based on the amount of compression signs is chosen from among the image data picturized continuously. Therefore, it becomes possible to obtain the good image data of a photography condition, without using no conventional blurring amendment device etc.

[Procedure amendment 31]

[Document to be Amended] Specification

[Item(s) to be Amended] 0114

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 32]

[Document to be Amended] Specification

[Item(s) to be Amended] 0115

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 33]

[Document to be Amended] Specification

[Item(s) to be Amended] 0122

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 34]

[Document to be Amended] Specification

[Item(s) to be Amended] 0123

[Method of Amendment] Modification

[The contents of amendment]

[0123]

(Claim 7)

In invention according to claim 7, the spatial-frequency component of image data is used as criteria of quality evaluation of a photography condition. Consequently, it enables them for

blurring, photographic subject Bure, focus gap, etc. to choose little [synthetically] image data appropriately, and to save it.

Since especially quality evaluation of such a spatial-frequency component can be performed by count, the piezo-electric gyroscope for blurring detection etc. becomes unnecessary. Therefore, even if it adopts invention according to claim 7, there is especially no need of adding sensor components etc. to an electronic camera from old, and it becomes possible to acquire the effectiveness of this invention with low cost and a simple configuration.

[Procedure amendment 35]

[Document to be Amended] Specification

[Item(s) to be Amended] 0124

[Method of Amendment] Modification

[The contents of amendment]

[0124]

Moreover, especially about the photographic subject in which the motion which cannot be predicted is shown like the flower which shakes to a wind, it is only the usual AF (automatic focusing) photography, and it becomes very difficult to prevent focus gap completely. However, under such an ill condition, based on a spatial-frequency component, image data with little focus gap can be chosen certainly, and can be saved in invention according to claim 7.

[Procedure amendment 36]

[Document to be Amended] Specification

[Item(s) to be Amended] 0125

[Method of Amendment] Modification

[The contents of amendment]

[0125]

(Claim 1)

In invention according to claim 1, the amount of high-frequency components of spatial frequency is judged from the amount of compression signs. Since the value of such an amount of compression signs can be acquired from the result of the picture compression processing from old etc., it does not need to add special data processing and becomes possible [aiming at mitigation of the amount of data processing, or the processing time].

[Procedure amendment 37]

[Document to be Amended] Specification

[Item(s) to be Amended] 0126

[Method of Amendment] Modification

[The contents of amendment]

[0126]

(Claim 8)

In invention according to claim 8, release time lag is used as one of the quality evaluations of a photography condition. Consequently, it becomes possible to choose and save comparatively little good image data of release time lag.

In a case which chooses image data with little release time lag from before release actuation in the condition of storing the image pick-up image temporarily, especially, it enables release time lag to obtain the image data very near zero.

[Translation done.]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平11-136557

(43) 公開日 平成11年(1999) 5月21日

(51) Int.Cl.⁸

H 0 4 N 5/225
5/91

識別記号

F I

H 0 4 N 5/225
5/91

F
J

審査請求 未請求 請求項の数10 O L (全 22 頁)

(21) 出願番号 特願平10-236102

(22) 出願日 平成10年(1998) 8月21日

(31) 優先権主張番号 特願平9-229637

(32) 優先日 平 9 (1997) 8月26日

(33) 優先権主張国 日本 (J P)

(71) 出願人 000004112

株式会社ニコン

東京都千代田区丸の内 3 丁目 2 番 3 号

(72) 発明者 江島 聡

東京都千代田区丸の内 3 丁目 2 番 3 号 株
式会社ニコン内

(72) 発明者 野崎 弘剛

東京都千代田区丸の内 3 丁目 2 番 3 号 株
式会社ニコン内

(74) 代理人 弁理士 古谷 史旺 (外 1 名)

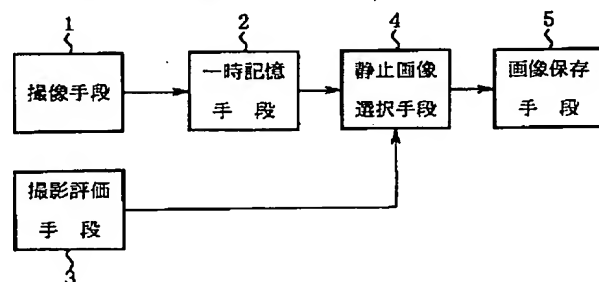
(54) 【発明の名称】 電子カメラ

(57) 【要約】

【課題】 本発明は、被写体像を撮像して画像データに変換する電子カメラに関し、特に、手ブレが少ないなどの撮影状態の良好な画像データを得ることを目的とする。

【解決手段】 被写体を連続的に撮像する撮像手段1と、撮像手段1により連続的に撮像される複数枚の画像データを一時記憶する一時記憶手段2と、撮像手段1により撮像される画像データについて、撮影状態の良否を評価する撮影評価手段3と、一時記憶手段2に記憶された画像データの中から、撮影評価手段3の評価が一番高い画像データを選択する静止画像選択手段4と、静止画像選択手段4により選択された画像データを保存する画像保存手段5とを備えて、電子カメラを構成する。

請求項 1 に記載の発明を説明する原理ブロック図



【特許請求の範囲】

【請求項1】 被写体を連続的に撮像する撮像手段と、前記撮像手段により連続的に撮像される複数枚の画像データを一時記憶する一時記憶手段と、前記撮像手段により撮像される画像データについて、撮影状態の良否を評価する撮影評価手段と、前記一時記憶手段に記憶された画像データの内から、前記撮影評価手段の評価が一番高い画像データを選択する静止画像選択手段と、前記静止画像選択手段により選択された画像データを保存する画像保存手段とを備えたことを特徴とする電子カメラ。

【請求項2】 請求項1に記載の電子カメラにおいて、前記一時記憶手段は、電子カメラのレリーズ操作後に、画像データの一時記憶を開始することを特徴とする電子カメラ。

【請求項3】 請求項1に記載の電子カメラにおいて、前記一時記憶手段は、レリーズ操作の待機状態において、前記撮像手段から新規の画像データを順次取り込んで一時記憶中の画像データを順次更新し、電子カメラのレリーズ操作後は、レリーズ操作の前後にわたる画像データを一時記憶した時点でデータ更新を休止することを特徴とする電子カメラ。

【請求項4】 請求項1ないし請求項3のいずれか1項に記載の電子カメラにおいて、前記一時記憶手段と前記画像保存手段とは、同じ記憶機構を兼用することを特徴とする電子カメラ。

【請求項5】 請求項1ないし請求項4のいずれか1項に記載の電子カメラにおいて、前記一時記憶手段は、前記撮像手段により連続的に撮像される複数枚の画像データを、差分圧縮して記憶する手段であることを特徴とする電子カメラ。

【請求項6】 被写体を連続的に撮像する撮像手段と、画像データを記憶可能な記憶媒体と、前記撮像手段により撮像される個々の画像データについて、撮影状態の良否を評価する撮影評価手段と、前記記憶媒体内の画像データに関する前記撮影評価手段の評価と、前記撮像手段からの新規の画像データに関する前記撮影評価手段の評価とを比較する比較手段と、前記比較手段の新旧比較により新規の画像データの評価が高い場合には、前記記憶媒体に新規の画像データを上書き記録する画像上書き手段とを備えたことを特徴とする電子カメラ。

【請求項7】 請求項1ないし請求項6のいずれか1項に記載の電子カメラにおいて、前記撮影評価手段は、前記撮影状態の良否評価の少なくとも一つとして、前記撮像手段のブレ量を検出する手段であることを特徴とす

る電子カメラ。

【請求項8】 請求項1または請求項7のいずれか1項に記載の電子カメラにおいて、前記撮影評価手段は、前記撮影状態の良否評価の少なくとも一つとして、前記画像データの空間周波数成分を判定することを特徴とする電子カメラ。

【請求項9】 請求項8に記載の電子カメラにおいて、前記撮影評価手段は、前記画像データの圧縮符号量に基づいて、空間周波数の高域成分量を判定することを特徴とする電子カメラ。

【請求項10】 請求項1ないし請求項9のいずれか1項に記載の電子カメラにおいて、前記撮影評価手段は、前記撮影状態の良否評価の少なくとも一つとして、電子カメラのレリーズ操作と画像データの撮像時点との時間ずれであるレリーズタイムラグを判定することを特徴とする電子カメラ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、被写体像を撮像して画像データを記録する電子カメラに関する。特に、本発明は、手ブレが少ないなどの撮影状態の良好な画像データを記録するための技術に関する。

【0002】

【従来の技術】一般に、手持ちでカメラ撮影を行うようなケースでは、往々にして手ブレを生じてしまう。このような手ブレが生じると、被写界が流れて露光されるため、全体にぼやけた画像が撮影される。このようにぼやけてしまった画像は、画面全体の細かなディテールが失われる上に、くっきり写るべきエッジ部分がだれてしまう。そのため、非常に印象の良くない画像となる。

【0003】従来、このような手ブレによる不具合を解消するものとして、手ブレ補正機構付きのカメラが知られている。図13は、この種の手ブレ補正機構付きカメラを示す図である。図13において、カメラ91の前面には、撮影レンズ92が取り付けられる。撮影レンズ92の鏡筒内には、ブレ補正光学系93が回動自在に配置される。

【0004】このブレ補正光学系93は、2軸のコアレスモータ94、95の回転が伝達され、上下および左右に振動する。一方、カメラ91側には、左右方向のブレ量を検出するブレ量検出センサ96と、上下方向のブレ量を検出するブレ量検出センサ97とが配置される。このような構成のカメラ91では、ブレ量検出センサ96、97を用いてカメラ本体の振動が検出される。カメラ91は、検出された振動と逆方向にコアレスモータ94、95を駆動し、ブレ補正光学系93の光軸を振動させる。その結果、撮影光軸の振動が打ち消され、手ブレが補正された良好な写真を撮影することができる。

【0005】

【発明が解決しようとする課題】ところで、このような従来例では、撮影レンズ92内にブレ補正光学系93を配置していた。そのため、撮影レンズ92が大型化かつ重量化するという問題点があった。また、ブレ補正光学系93を配置するスペースを撮影レンズ92内に確保しなければならず、撮影レンズ92の設計自由度が低くなるという問題点があった。

【0006】さらに、ブレ補正光学系93を設けた分だけ、撮影レンズ92内の内面反射が増える。そのため、逆光撮影時などにおいてフレアを生じやすいという問題点があった。また、ブレ補正光学系93を駆動する際に電力を消費するため、バッテリー寿命が短くなるという問題点があった。

【0007】さらに、ブレ補正光学系93を駆動する際に僅かながら騒音が生じるという問題点もあった。また一方、ぼやけた画像は、上述した手ブレに限らず、被写体ブレやピントブレにおいても発生する。しかしながら、従来の手ブレ補正機構はカメラの振動を打ち消すのみであるため、これらの被写体ブレやピントブレについては一切防止できないという問題点があった。

【0008】特に、近年における撮像素子の高解像度化や小型化に伴い、1画素当たりの受光面積はますます縮小し、撮像素子の実効感度は低くなっている。そのため、撮像素子の露光時間は一般的に長くなる傾向にあり、手ブレや被写体ブレの発生する頻度が一段と高くなっている。そのため、特に電子カメラにおいては、これら手ブレや被写体ブレに対する対策が早急に望まれている。また、風で揺れる花のように、予測不能な動きを示す被写体については、従来のAF（自動焦点）撮影においても、正確にピントブレを防ぐことは非常に困難であった。そのため、このような悪条件下においても、ピントブレを確実に解消する電子カメラが強く望まれている。

【0009】そこで、請求項1～10のいずれか1項に記載の発明では、上述の問題点を解決するために、撮影状態の良好な画像データを確実に得ることが可能な電子カメラを提供することを目的とする。特に、請求項2に記載の発明では、省電力化を図ることが可能な電子カメラを提供することを目的とする。

【0010】請求項3に記載の発明では、レリーズタイムラグの最悪値をほぼ半減することができる電子カメラを提供することを目的とする。請求項4に記載の発明では、構成を単純化した電子カメラを提供することを目的とする。請求項5に記載の発明では、一時記憶手段（後述）の記憶容量を低減するか、もしくは画像データの標本数を増やすことを目的とする。

【0011】請求項6に記載の発明では、一時記憶手段（後述）を省くことが可能な電子カメラを提供することを目的とする。請求項7に記載の発明では、手ブレの少

ない良好な画像データを得ることができる電子カメラを提供することを目的とする。請求項8に記載の発明では、被写体ブレやピントブレの少ない良好な画像データを得ることができる電子カメラを提供することを目的とする。請求項9に記載の発明では、空間周波数成分の分析を効率的に行うことが可能な電子カメラを提供することを目的とする。請求項10に記載の発明では、レリーズタイムラグが小さい良好な画像データを得ることができる電子カメラを提供することを目的とする。

【0012】

【課題を解決するための手段】

（請求項1）図1は、請求項1に記載の発明を説明するための概略ブロック図である。請求項1に記載の発明は、被写体を連続的に撮像する撮像手段1と、撮像手段1により連続的に撮像される複数枚の画像データを一時記憶する一時記憶手段2と、撮像手段1により撮像される画像データについて、撮影状態の良否を評価する撮影評価手段3と、一時記憶手段2に記憶された画像データの内から、撮影評価手段3の評価が一番高い画像データを選択する静止画像選択手段4と、静止画像選択手段4により選択された画像データを保存する画像保存手段5とを備えたことを特徴とする。

【0013】（請求項2）請求項2に記載の発明は、請求項1に記載の電子カメラにおいて、一時記憶手段2は、電子カメラのレリーズ操作後に、画像データの一時記憶を開始することを特徴とする。

【0014】（請求項3）請求項3に記載の発明は、請求項1に記載の電子カメラにおいて、一時記憶手段2は、レリーズ操作の待機状態において、撮像手段1から新規の画像データを順次取り込んで一時記憶中の画像データを順次更新し、電子カメラのレリーズ操作後は、レリーズ操作の前後にわたる画像データを一時記憶した時点でデータ更新を休止することを特徴とする。

【0015】（請求項4）請求項4に記載の発明は、請求項1ないし請求項3のいずれか1項に記載の電子カメラにおいて、一時記憶手段2と画像保存手段5とは、同じ記憶機構を兼用することを特徴とする。

【0016】（請求項5）請求項5に記載の発明は、請求項1ないし請求項4のいずれか1項に記載の電子カメラにおいて、一時記憶手段2は、撮像手段1により連続的に撮像される複数枚の画像データを、差分圧縮して記憶する手段であることを特徴とする。

【0017】（請求項6）図2は、請求項6に記載の発明を説明するための概略ブロック図である。請求項6に記載の発明は、被写体を連続的に撮像する撮像手段1と、画像データを記憶可能な記憶媒体10と、撮像手段1により撮像される個々の画像データについて、撮影状態の良否を評価する撮影評価手段3と、記憶媒体10内の画像データに関する撮影評価手段3の評価と、撮像手段1からの新規の画像データに関する撮影評価手段3の

評価とを比較する比較手段11と、比較手段11の比較により新規の画像データの評価が高い場合には、記憶媒体10に新規の画像データを上書き記録する画像上書き手段12とを備えたことを特徴とする。

【0018】(請求項7)請求項7に記載の発明は、請求項1ないし請求項6のいずれか1項に記載の電子カメラにおいて、撮影評価手段3は、撮影状態の良否評価の少なくとも一つとして、撮像手段1のブレ量を検出する手段であることを特徴とする。

【0019】(請求項8)請求項8に記載の発明は、請求項1または請求項7のいずれか1項に記載の電子カメラにおいて、撮影評価手段3は、撮影状態の良否評価の少なくとも一つとして、画像データの空間周波数成分を判定することを特徴とする。

【0020】(請求項9)請求項9に記載の発明は、請求項8に記載の電子カメラにおいて、撮影評価手段3は、画像データの圧縮符号量に基づいて、空間周波数の高域成分量を判定することを特徴とする。

【0021】(請求項10)請求項10に記載の発明は、請求項7ないし請求項9のいずれか1項に記載の電子カメラにおいて、撮影評価手段3は、撮影状態の良否評価の少なくとも一つとして、電子カメラのレリーズ操作と画像データの撮像時点との時間ずれであるレリーズタイムラグを判定することを特徴とする。

【0022】《各請求項ごとの作用説明》請求項1にかかわる電子カメラでは、撮像手段1が被写体像を連続的に撮像する。このように撮像された複数枚の画像データは、一時記憶手段2に一時記憶される。一方、撮影評価手段3は、個々の画像データについて撮影状態の良否を評価する。静止画像選択手段4は、この撮影状態の評価が一番高い期間に撮像された画像データを、一時記憶手段2に記憶された画像データの内から選択する。画像保存手段5は、この選択された画像データの保存を行う。

【0023】以上の動作により、請求項1の電子カメラでは、撮影状態の良好な画像データを選択的に得ることができる。また特に、請求項1の電子カメラでは、撮影期間中は、一時記憶手段2が画像データを一旦記憶する。したがって、画像データの選択処理は撮影完了後に行えば足りるので、撮影期間中の処理動作を無理なく軽減することが可能となる。

【0024】請求項2にかかわる電子カメラでは、一時記憶手段2が、電子カメラのレリーズ操作後に、画像データの一時記憶を開始する。したがって、レリーズ操作後の画像データの内から、撮影状態の良好な画像データを選択することとなる。このような動作にあつては、レリーズ操作後に動作を開始すればよく、撮像動作などを常時行う必要はない。したがって、電子カメラの省電力化を図ることが可能となる。

【0025】請求項3にかかわる電子カメラでは、レリーズ操作の待機中、一時記憶手段2は、撮像手段1から

新規の画像データを順次取り込む。一時記憶手段2は、この新規の画像データを用いて画像データを更新し、一時記憶中の複数枚の画像データを最新の状態に保つ。この状態で電子カメラがレリーズ操作されると、一時記憶手段2は、レリーズ操作の前後にわたる画像データを一時記憶した時点でデータ更新を休止する。

【0026】このような動作により、一時記憶手段2に残存する画像データの標本区間は、レリーズ操作の前後にまたがった区間となる。特に、レリーズ操作の直前においては、レリーズ操作に伴う手ブレがほとんど生じない。そのため、このようなレリーズ直前の期間を標本区間に加えることにより、手ブレの一層少ない画像データを選択できる可能性が非常に高くなる。その上、画像データの標本区間がレリーズ操作の前後にまたがるので、同じ時間長の標本区間をレリーズ操作以降にのみ配する場合に比べ、レリーズタイムラグの最悪値(標本区間の端点とレリーズ操作時点との時間間隔に相当する)がほぼ半減する。

【0027】請求項4にかかわる電子カメラでは、一時記憶手段2と画像保存手段5とが、同じ記憶機構を兼用する。したがって、電子カメラの構成が単純化される。

【0028】請求項5にかかわる電子カメラでは、一時記憶手段2は、撮像手段1で連続的に撮像される画像データを差分圧縮して記憶する。ここでの差分圧縮は、画像間の差分データを求めて圧縮するものであり、例えば、単純なフレーム間の差分圧縮や、動き補償予測などの技法を含む差分圧縮などである。通常、撮像手段1で連続撮影される画像データは、動画像におけるフレーム相関ほどではないにしても、非常に高い相関を有する。したがって、上記のような差分圧縮により、画像データの符号量を一段と小さくすることが可能となる。

【0029】したがって、一時記憶手段2に記憶可能な画像データの標本数は増やすことが可能となる。このように画像データの標本数が増えることにより、より撮影状態の良好な画像データを選択できる可能性が高くなる。また、画像データの標本数を増やさない場合には、一時記憶手段2の記憶容量を減らすことが可能となる。

【0030】請求項6にかかわる電子カメラでは、撮像手段1が被写体像を連続的に撮像する。このとき、撮影評価手段3は、撮影状態の良否を評価する。比較手段11は、記憶媒体10内の画像データに関する評価と、撮像手段1からの新規の画像データに関する新しい評価とを比較する。ここで、新しい評価の方が高い場合、画像上書き手段12は、記憶媒体10に新規の画像データを上書き記録する。その結果、記憶媒体10には、撮影状態のより良好な画像データが残ることとなる。特に、請求項6の電子カメラでは、一連の画像データを全て一時記憶する必要がなく、大容量の一時記憶手段などが不要となる。

【0031】請求項7にかかわる電子カメラでは、撮影

状態の良否評価として、撮像手段1のブレ量(振動量や角速度など)を検出する。撮像手段1のブレ量が少ないほど、手ブレは少なく撮影状態が良好であると評価することができる。このように、撮像手段1のブレ量を尺度に撮影状態の良否評価を行うことにより、より手ブレの少ない画像データを得ることが可能となる。

【0032】請求項8にかかわる電子カメラでは、撮影状態の良否評価の尺度として、画像データの空間周波数成分を用いる。通常、連続的に撮像される画像データは、絵柄自体はさほど変わらず、空間周波数の分布はほぼ不変と想定される。しかしながら、これらの画像データに、手ブレや被写体ブレやピントズレなどが生じると、画像データが平滑化されて高域の空間周波数成分が損なわれる。

【0033】したがって、これらの画像データの中で、高域の空間周波数成分が比較的多いものほど、手ブレや被写体ブレやピントズレが総合的に少なく、撮影状態がより良好であると評価することができる。このように、画像データの空間周波数成分を尺度に撮影状態の良否評価を行うことにより、手ブレ、被写体ブレ、並びにピントズレが総合的に少ない画像データを的確に選択することが可能となる。

【0034】請求項9にかかわる電子カメラでは、画像データの空間周波数成分を圧縮符号量から判定する。通常、圧縮符号量が多いほど、高域の空間周波数成分が多いと判断できる。したがって、連続的に撮像される画像データの中で、圧縮符号量がより多いものほど、手ブレや被写体ブレやピントズレが総合的に少なく、撮影状態がより良好であると評価することができる。また、このような圧縮符号量の値は、従前からの画像圧縮処理の結果から得られるので、特段の処理を付加する必要はない。

【0035】請求項10にかかわる電子カメラでは、撮影状態の良否評価の少なくとも一つとして、レリーズタイムラグを検出する。このレリーズタイムラグが少ないほど、撮影者が意図するシャッタタイミングに近く、撮影状態がより良好であると評価することができる。このように、レリーズタイムラグを良否評価の項目とすることにより、よりレリーズタイムラグの少ない画像データを選択することが可能となる。

【0036】また特に、請求項3の発明のようにレリーズ操作の前から撮像画像の一時記憶を行っている状態で、レリーズタイムラグの少ない画像データを選択する場合について説明する。この場合、レリーズ操作の瞬間にたまたま露光動作中である可能性が当然に存在する。したがって、電子カメラの単写撮影では従来なし得なかった、レリーズタイムラグが完全にゼロの画像を、自動的に画像選択して得ることが可能となる。

【0037】なお、上述した請求項7～10の説明では、説明の都合上、良否評価を一つの評価項目のみで行

うように述べているが、これに発明内容が限定されるものではない。良否評価は、これら複数の評価項目に優先順位を設けて行うものでもよいし、評価項目に重み付けして総合的な評価を行うものでも勿論よい。このとき、請求項7～10以外の評価項目が含まれていても勿論かまわない。

【0038】また、上述した請求項1～10における電子カメラは、単体構成の電子カメラに狭く限定されるものではない。近年の電子カメラは、撮像ユニットと情報機器(コンピュータや電子手帳など)とに分離構成されるなど、複数機器のシステムとして構成される傾向にある。このようなシステム構成においては、本発明の動作を、複数機器間において適宜に分担することが可能となる。

【0039】例えば、(1)撮像ユニット側では連続撮影した画像データを一時記憶する。(2)情報機器側ではこれら一連の画像データの中から撮影状態の良否評価に応じて画像を選択保存する、などの動作分担が可能である。なお、このような場合の情報機器側の動作は、「撮像ユニット側から良否評価の結果を取得するか、もしくは画像データの空間周波数成分などから撮影状態の良否評価を行うステップ」と、「その良否評価の結果に応じて画像データを選択保存するステップ」とを情報機器に実行させるプログラム(を記録した機械読み取り可能な記録媒体)を用いて、実現することが可能となる。

【0040】

【発明の実施の形態】以下、図面に基づいて本発明における実施の形態を説明する。

【0041】(第1の実施形態)図3は、第1の実施形態を示すブロック図である。なお、第1の実施形態は、請求項1, 2, 4, 5, 7に記載の発明に対応した実施形態である。図3において、電子カメラ21の前面には、撮影レンズ22が取り付けられる。この撮影レンズ22の像空間側には、撮像素子23の受光面が配置される。

【0042】この撮像素子23の画像出力は、色信号処理やA/D変換やγ補正や画像圧縮などを行う画像処理部24を介して、画像メモリ25に直接に記憶される。その他、画像メモリ25には、マイクロプロセッサ26のデータバスを介してデータの読み書きも行われる。また、電子カメラ21の筐体内には、圧電ジャイロなどの角速度センサからなるブレ量検出センサ29a, 29bが配置される。このブレ量検出センサ29aは、上下方向(ピッチング)のブレ量を検出する。もう一方のブレ量検出センサ29bは、左右方向(ヨーイング)のブレ量を検出する。これらのブレ量検出センサ29a, 29bの出力端子は、マイクロプロセッサ26のA/D入力端子にそれぞれ接続される。

【0043】さらに、電子カメラ21の筐体上面にはレリーズ鈕30が配置され、レリーズ鈕30のスイッチ出

力は、マイクロプロセッサ26に接続される。また、マイクロプロセッサ26からの電子シャッタの制御信号は、CCD駆動回路31に与えられる。CCD駆動回路31は、この制御信号に応じて駆動パルスを生成し、撮像素子23に与える。その他、マイクロプロセッサ26には、タイマー32および赤外線転送インターフェース33が接続される。

【0044】なお、請求項1、2、4、5、7に記載の発明と第1の実施形態との対応関係については、撮像手段1は撮像素子23およびCCD駆動回路31に対応し、一時記憶手段2は画像メモリ25および画像処理部24の「画像データを差分圧縮して一時記憶する機能」に対応し、撮影評価手段3はブレ量検出センサ29a、29bに対応し、静止画像選択手段4はマイクロプロセッサ26の「ブレ量に基づいて画像データを選択する機能」に対応し、画像保存手段5は画像メモリ25およびマイクロプロセッサ26の「選択した画像データを保存する機能」に対応する。

【0045】次に、第1の実施形態の動作について説明する。図4は、第1の実施形態の動作を説明する流れ図である。まず、電子カメラ21の主電源が投入されると、マイクロプロセッサ26はリリース釦30が押されるまで待機する(図4S1のNO側)。ここで、リリース釦30が押されると(図4S1のYES側)、マイクロプロセッサ26は、CCD駆動回路31を起動して、撮像素子23内の不要電荷を一旦排出する。このような不要電荷の排出後、撮像素子23には、受光面に投影される被写体像の明るさに応じて、信号電荷が新たに蓄積する(図4S2)。

【0046】このような信号電荷の蓄積期間中に、マイクロプロセッサ26は、ブレ量検出センサ29aから上下方向のブレ量W1を取得する。もう一方のブレ量検出センサ29bから左右方向のブレ量W2を取得する。マイクロプロセッサ26は、これらブレ量W1、W2について二乗値の和もしくは絶対値の和などを算出し、電子カメラ21全体のブレ量Wとする(図4S3)。

【0047】予め定められた蓄積時間が経過すると、マイクロプロセッサ26は、CCD駆動回路31を介して、撮像素子23から画像データを読み出す(図4S4)。画像処理部24は、この画像データに対してA/D変換やγ補正や画像圧縮などを施した後、画像メモリ25内の一時記憶領域にそのまま記録する。なお、ここでの画像圧縮は、MP EGなどと同様の差分圧縮が適用される。またこのとき、マイクロプロセッサ26は、ブレ量Wを画像データに関連付けて記録する(図4S5)。

【0048】上述した一連の動作S2～S5を、リリース操作から制限時間0.3秒経過するまで、繰り返し実行する(図4S6のYES側)。ここまでの動作により、画像メモリ25の内には、リリース操作から0.3

秒間に撮像された複数フレーム分の画像データが、撮像期間中のブレ量Wと一緒に記録される。

【0049】マイクロプロセッサ26は、これらのブレ量Wの中から一番小さな値を探し、その一番小さなブレ量Wが検出された期間に撮像されていた画像データAを見つけ出す(図4S7)。ちなみに、図5は、一般的なブレ量Wの時間変化の様子を示した図である。この図5からわかるように、0.3秒間に少なくとも一回程度、ブレ量Wが最小になることが期待できる。したがって、上記のように選択した画像データAは、手ブレが十分に少なく、良好な画像データであることが予想される。

【0050】マイクロプロセッサ26は、この画像データAを、画像メモリ25内の保存領域に記録する(図4S8)。なお、画像メモリ25内で画像データAを実際に移動することなく、画像メモリ25の管理領域やファイル属性の変更などを施すことにより、画像データAの保存処理を済ませてもよい。また、画像データAが差分圧縮されていた場合は、画像伸長した上で新たにJ P E G圧縮するなどして保存すればよい。

【0051】以上説明した動作により、第1の実施形態では、連続的に撮像した画像データの内から、ブレ量Wが一番小さい画像データを選択する。したがって、従来のような手ブレ補正機構を一切使うことなく、手ブレの少ない画像データを得ることが可能となる。また、撮影レンズ22内に手ブレ補正用の光学系を配置する必要がなくなるので、撮影レンズ22の小型化および軽量化を容易に図ることができる。

【0052】その上、手ブレ補正用の光学系を配置するためのスペースを撮影レンズ22内に確保する必要も当然なくなり、撮影レンズ22の設計自由度が高くなる。そのため、撮影レンズ22の収差性能を無理なく向上させることが可能となる。さらに、手ブレ補正用の光学系による内面反射が解消されるため、逆光撮影時のフレアなども軽減する。

【0053】その上、手ブレ補正用の駆動機構なども必要なくなるので、省電力化を図ってバッテリー寿命を延長することが可能となる。さらに、手ブレ補正用の駆動機構から騒音や振動が生じるという不具合も解消される。また、画像データの一時記憶用と保存用の両方に画像メモリ25を兼用しているため、画像メモリを別途設ける必要がなく、電子カメラ21の構成を単純化することができる。

【0054】なお、上述した実施形態では、画像メモリ25の記憶領域を一時記憶領域と保存領域とに固定的に割り付けているが、これに限定されるものではない。例えば、画像メモリ25内の一時記憶領域を動的に割り付けるようにしてもよい。このような構成では、一時記憶領域を徐々に保存領域に割くことにより、画像メモリ25の記憶領域一杯に画像データを保存することが可能となる。次に、別の実施形態について説明する。

【0055】(第2の実施形態)図6は、第2の実施形態を示すブロック図である。なお、第2の実施形態は、請求項1, 3, 7, 10に記載の発明に対応した実施形態である。図6において、電子カメラ41の前面には、撮影レンズ42が取り付けられる。この撮影レンズ42の像空間側には、撮像素子43の受光面が配置される。

【0056】撮像素子43からの画像出力は、色信号処理やA/D変換やγ補正などを行う画像処理部44を介して画像メモリ45のデータ入力に接続される。一方、画像メモリ45のデータ出力は、マイクロプロセッサ46のデータ入力に接続される。また、マイクロプロセッサ46のデータ出力端子には、画像記録部47を介してメモリカード48が着脱自在に接続される。

【0057】一方、電子カメラ41の筐体内側には、圧電ジャイロなどの角速度センサからなるブレ量検出センサ49a, 49bが配置される。これらのブレ量検出センサ49a, 49bの出力は、マイクロプロセッサ46のA/D入力端子にそれぞれ接続される。さらに、電子カメラ41の筐体上面にはレリーズ鉤50が配置され、レリーズ鉤50のスイッチ出力は、マイクロプロセッサ46に接続される。

【0058】また、マイクロプロセッサ46からの電子シャッタの制御信号は、CCD駆動回路51に与えられる。CCD駆動回路51は、この制御信号に応じて駆動パルスを生成し、撮像素子43に与える。その他、マイクロプロセッサ46には、タイマー52が接続される。なお、請求項1, 3, 7, 10に記載の発明と第2の実施形態との対応関係については、撮像手段1は撮像素子43およびCCD駆動回路51に対応し、一時記憶手段2は画像メモリ45および画像処理部44の「レリーズ操作前後の画像データを一時記憶する機能」に対応し、撮影評価手段3はブレ量検出センサ49a, 49b、タイマー52およびマイクロプロセッサ46の「レリーズタイムラグを計測する機能」に対応し、静止画像選択手段4はマイクロプロセッサ46の「評価値に基づいて画像データを選択する機能」に対応し、画像保存手段5は画像記録部47およびメモリカード48に対応する。

【0059】次に、第2の実施形態の動作について説明する。図7は、第2の実施形態の動作を説明する流れ図である。まず、電子カメラ41の主電源が投入されると、マイクロプロセッサ46はCCD駆動回路51を介して、撮像素子43内の不要電荷を一旦排出する。この

$$\text{評価値} E = \alpha \cdot |T_e - T_r| + \beta \cdot |W| \dots (1)$$

ここで、右辺の第1項はレリーズタイムラグに関する項であり、第2項はブレ量Wに関する項である。また、係数 α , β は、これら2つの項の重み付けを行うものである(例えば、 $\alpha=1$, $\beta=1$ などに設定される)。マイクロプロセッサ46は、個々の評価値Eの中から一番小さな値を探し、その一番小さな評価値Eと関連付けられた画像データAを見つけ出す(図7S23)。

ような不要電荷の排出後、撮像素子43では、受光面に投影される被写体像の明るさに応じて、信号電荷が蓄積される(図7S11)。

【0060】この信号電荷の蓄積期間中に、マイクロプロセッサ46は、ブレ量検出センサ49aから上下方向のブレ量W1を取得する。もう一方のブレ量検出センサ49bから左右方向のブレ量W2を取得する。マイクロプロセッサ46は、これらブレ量W1, W2について二乗値の和もしくは絶対値の和などを算出し、電子カメラ41全体のブレ量Wとする(図7S12)。

【0061】次に、マイクロプロセッサ46は、タイマー52から現在の時刻を撮像時刻 T_e として取得する(図7S13)。この状態で、予め定められた蓄積時間が経過すると、マイクロプロセッサ46は、CCD駆動回路51を介して、撮像素子43から画像データを読み出す(図7S14)。

【0062】画像処理部44は、この画像データに対してA/D変換やγ補正などを施した後、画像メモリ45に一時記憶する(図7S15)。このとき、マイクロプロセッサ46は、ブレ量Wおよび撮像時刻 T_e を画像データと関連付けて記憶する(図7S17)。なお、このとき既に、画像メモリ45内の画像データが7フレーム分に達している場合には(図7S16)、画像メモリ45内の一番古いデータに代えて最新データを上書き記録する(図7S18)。

【0063】ここで、マイクロプロセッサ46は、レリーズ鉤50が押されたか否かを判定する(図7S19)。レリーズ鉤50が押された場合(図7S19のYES側)、マイクロプロセッサ46は、タイマー52から現在の時刻を取得し、レリーズ操作の時刻 T_r として記憶する(図7S20)。

【0064】上述した動作S11~20を、レリーズ操作後の画像データが4フレーム分記録されるまで繰り返し実行する(図7S21のNO側)。一方、レリーズ操作後の画像データが4フレーム分記録されると(図7S21のYES側)、マイクロプロセッサ46は撮像動作を停止した後、画像データの選択を次の手順で実行する。まず、マイクロプロセッサ46は、画像メモリ45内の各画像データについて(1)式を用いて評価値Eを算出する(図7S22)。

【0065】

【0066】マイクロプロセッサ46は、この画像データAを画像メモリ45から読み出して画像圧縮する。マイクロプロセッサ46は、画像圧縮された画像データAを、画像記録部47を介してメモリカード48に保存する(図7S24)。なお、画像圧縮の処理については、ここで行う代わりに、図7に示すステップS17, S18において済ませておいてもよい。

【0067】次に、マイクロプロセッサ46は、画像メモリ45および制御データを初期化した後、ステップS11に動作を戻す(図7S25)。以上説明した一連の動作により、第2の実施形態では、連続的に撮像した画像データの内から、評価値Eが一番小さい画像データを選択する。したがって、評価値Eを基準にして、手ブレの少なく、かつレリーズタイムラグが小さい画像データを得ることが可能となる。

【0068】また、レリーズ操作の前後にわたる画像データの中から、画像データを選択を行うので、レリーズ操作後に限定されることなく、より適正な画像データを選択することができる。なお、上述した第2の実施形態では、主電源の投入時点から画像データの一時記憶を開始しているが、本発明はこれに限定されるものではない。例えば、マイクロプロセッサ46が、レリーズ釦50の半押しを検出し、その半押し時点から画像データの一時記憶を開始してもよい。このような構成では、画像データの一時記憶を常時行う必要がないので、電子カメラの省電力化を図ることが可能となる。次に、別の実施形態について説明する。

【0069】(第3の実施形態)図8は、第3の実施形態を示すブロック図である。なお、第3の実施形態は、請求項6、7に記載の発明に対応した実施形態である。図8において、電子カメラ61の前面には、撮影レンズ62が取り付けられる。この撮影レンズ62の像空間側には、撮像素子63の受光面が配置される。

【0070】撮像素子63の画像出力は、色信号処理やA/D変換や補正などを行う画像処理部64を介してマイクロプロセッサ65に与えられる。また、マイクロプロセッサ65のデータバスには、画像メモリ66が接続される。さらに、マイクロプロセッサ65のデータ出力端子には、画像記録部67を介してメモリカード68が着脱自在に接続される。

【0071】また、電子カメラ61の筐体内側には、圧電ジャイロなどの角速度センサからなるブレ量検出センサ69a、69bが配置される。これらのブレ量検出センサ69a、69bの出力は、マイクロプロセッサ65のA/D入力端子にそれぞれ接続される。さらに、電子カメラ61の筐体上面にはレリーズ釦70が配置され、レリーズ釦70のスイッチ出力は、マイクロプロセッサ65に接続される。

【0072】また、マイクロプロセッサ65からの電子シャッタの制御信号は、CCD駆動回路71に与えられる。CCD駆動回路71は、この制御信号に応じて駆動パルスを生成し、撮像素子63に与える。なお、請求項6、7に記載の発明と第3の実施形態との対応関係については、撮像手段1は撮像素子63およびCCD駆動回路71に対応し、撮影評価手段3はブレ量検出センサ69a、69bに対応し、記憶媒体10は画像メモリ66に対応し、比較手段11はマイクロプロセッサ65の

「ブレ量の新旧比較を行う機能」に対応し、画像上書き手段12はマイクロプロセッサ65の「画像データを画像メモリ66に上書きする機能」に対応する。

【0073】次に、第3の実施形態の動作について説明する。図9は、第3の実施形態の動作を説明する流れ図である。まず、電子カメラ61の主電源が投入されると、マイクロプロセッサ65は、現在のシャッタ速度と焦点距離とに基づいて、ブレ量の最大許容値を決定する(図9S31)。

【0074】次に、マイクロプロセッサ65は、このように決定した最大許容値を最小ブレ量 W_{min} に初期設定する(図9S32)。マイクロプロセッサ65は、レリーズ釦70が押されるまで、ステップS31に戻って上記の動作を定期的に繰り返す(図9S33のNO側)。一方、レリーズ釦70が押されると(図9S33のYES側)、マイクロプロセッサ65は、レリーズ操作の時点から0.5秒経過するまでの期間、次のようにステップS35~40を繰り返し実行する(図9S34)。

【0075】まず、マイクロプロセッサ65は、CCD駆動回路71を介して、撮像素子63内の不要電荷を一旦排出する。このような不要電荷の排出後、撮像素子63では、受光面に投影される被写体像の明るさに応じて、信号電荷が蓄積される(図9S35)。この信号電荷の蓄積期間中に、マイクロプロセッサ65は、ブレ量検出センサ69aから上下方向のブレ量 $W1$ を取得する。もう一方のブレ量検出センサ69bから左右方向のブレ量 $W2$ を取得する。マイクロプロセッサ65は、これらブレ量 $W1$ 、 $W2$ について二乗値の和もしくは絶対値の和などを算出し、電子カメラ61全体のブレ量 W とする(図9S36)。

【0076】ここで、マイクロプロセッサ65は、最小ブレ量 W_{min} とブレ量 W とを大小比較する。このような比較の結果、ブレ量 W の方が大きい場合には(図9S37のNO側)、マイクロプロセッサ65は、撮像素子63から画像データを読み出さずに、ステップS34に動作を戻す。

【0077】なお、この判断の時点で、マイクロプロセッサ65が撮像素子63から不要電荷を排出させることにより、次コマの電荷蓄積をなるべく早く開始してもよい。このような動作によれば、無駄な蓄積時間を極力排して単位時間当たりの撮影枚数を無理なく増やすことが可能となる。一方、ブレ量 W の方が小さい場合には(図9S37のYES側)、マイクロプロセッサ65は、予め定められた蓄積時間が経過した後、撮像素子63から画像データを読み出す(図9S38)。

【0078】マイクロプロセッサ65は、画像処理部64を介してこの画像データを取り込み、画像メモリ66に上書き記録する(ステップS39)。このような上書き記録に伴って、マイクロプロセッサ65は、最小ブレ量 W_{min} に今回のブレ量 W を設定した後(ステップS4

0)、ステップS34に動作を戻す。

【0079】上述した一連の動作S34～40を、リリース操作から制限時間0.5秒経過するまで繰り返し実行した後、マイクロプロセッサ65はステップS41に動作を移行する。ここまでの動作により、画像メモリ66には、リリース操作から0.5秒間に撮像される画像データの中で、ブレ量Wの一番小さい画像データが記録される。

【0080】このような場合(図9S41のYES側)、マイクロプロセッサ65は、画像メモリ66内に残った画像データを画像圧縮した後、画像記録部67を介してメモリカード68に保存する(図9S43)。なお、画像圧縮の処理については、ここで言う代わりに、図9に示すステップS39において済ませておいてもよい。このように画像データの保存を完了した後、マイクロプロセッサ65は、次の撮影動作に備えて画像メモリ66内の画像データを消去した後(図9S44)、ステップS31に動作を戻す。

【0081】なお、ブレ量Wが一度もブレ量の最大許容値を下回らなかったケースにおいては、画像メモリ66に画像データは一切記録されない。このように画像メモリ66に画像データが存在しない場合(図9S41のNO側)、マイクロプロセッサ65は、手ブレが大きすぎたと判断して「手ブレ警告」の処理を行った後、ステップS31に動作を戻す(図9S42)。

【0082】以上説明した動作により、第3の実施形態では、よりブレ量の少ない画像データを画像メモリ66に残すこととなる。したがって、従来の手ブレ補正機構を一切使わずに、手ブレの少ない画像データを得ることができる。また、画像メモリ66は、次々に画像データが上書き記録されることとなるので、少なくとも1フレーム分の画像データを記憶する容量があれば十分である。

【0083】なお、第3の実施形態では、ブレ量の比較に基づいて、よりブレ量の少ない画像データを画像メモリ66に残しているが、これに限定されるものではない。請求項7～10の評価項目などを含む評価値を基準にして、画像メモリ66に残す画像データを選択してもよい。また、第3の実施形態では、ブレ量Wが「ブレ量の最大許容値」を下回らない場合に画像データを一切記録していないが、これに限定されるものではない。例えば、最初の画像データなどをとりあえず記録し、それ以降については、ブレ量Wが下回るたびに画像データを更新するようにしてもよい。このような構成では、ブレ量Wが一番小さな画像データを最終的に記録することができる。

【0084】なお、第1～3の実施形態では、ブレ量もしくは評価値を基準にして、1枚分の画像データのみを保存しているが、これに限定されるものではない。例えば、ブレ量もしくは評価値を基準にして、評価順位の上

位から所定枚分の画像データを保存するようにしてもよい。このような構成では、操作者自身が、所定枚分の画像データの内から、シャッタチャンスのより好ましい画像データを後で選ぶことができる。次に、別の実施形態について説明する。

【0085】(第4の実施形態)図10は、第4の実施形態を示すブロック図である。なお、第4の実施形態は、請求項1, 2, 8に記載の発明に対応した実施形態である。図10において、電子カメラ101の前面には、ズームレンズ102が取り付けられる。このズームレンズ102の像空間側には、撮像素子103の受光面が配置される。

【0086】撮像素子103からの画像出力は、色信号処理やA/D変換や補正などを行う画像処理部104、および画像メモリ105を介して、画像圧縮部106aに接続される。この画像圧縮部106aの出力は、マイクロプロセッサ106に接続される。また、マイクロプロセッサ106には、画像記録部107を介してメモリカード108が着脱自在に接続される。

【0087】さらに、電子カメラ101の筐体には、リリース釦110および撮影モード選択釦111が配置され、これら操作部のスイッチ出力は、マイクロプロセッサ106に接続される。また、マイクロプロセッサ106からの電子シャッタの制御信号は、CCD駆動回路112に与えられる。CCD駆動回路112は、この制御信号に応じて駆動パルスを生成し、撮像素子103に与える。

【0088】その他、電子カメラ101には、被写体輝度を測光する測光部113、被写体距離を測定する測距部114、レンズ位置から焦点距離を検出するエンコーダ115、並びに閃光部(いわゆるストロボ)116が設けられ、それぞれマイクロプロセッサ106に接続される。なお、請求項1, 2, 8に記載の発明と第4の実施形態との対応関係については、撮像手段1は撮像素子103およびCCD駆動回路112およびズームレンズ102に対応し、一時記憶手段2は画像メモリ105に対応し、撮影評価手段3は画像圧縮部106aの「画像データを空間周波数成分に変換する機能」に対応し、静止画像選択手段4はマイクロプロセッサ106の「空間周波数成分に基づいて画像データを選択する機能」に対応し、画像保存手段5は画像記録部107およびメモリカード108に対応する。

【0089】次に、第4の実施形態の動作について説明する。図11は、第4の実施形態の動作を説明する流れ図である。まず、電子カメラ101の主電源が投入されると、マイクロプロセッサ106はリリース釦110が押されるまで待機する(図11S1のNO側)。ここで、リリース釦110が押されると(図11S1のYES側)、マイクロプロセッサ106は、現在の撮影モードを判別する(図11S2)。もしも、現在の撮影モー

ドが、下記(1)～(3)のいずれでもない場合、マイクロプロセッサ106は、通常の撮影(1コマ撮像して記録する撮影)を実行した後(図11S3)、ステップS1に動作を戻す。

【0090】(1)夜景撮影モード・・・閃光発光を切り、焦点を無限遠に調整し、長時間露光を可能とするモード

(2)マクロモード・・・レンズの焦点をマクロ領域に設定して近接撮影を行うモード

(3)スポーツモード・・・露光時間となるべく短く設定し、高速に動く被写体を撮影するモード

一方、現在の撮影モードが、これらの撮影モードのいずれかであった場合、手ブレや被写体ブレやピントズレが起こる可能性が特に高いので、マイクロプロセッサ106は、ステップS4以降の対策動作を実行する。

【0091】まず、マイクロプロセッサ106は、CCD駆動回路112に複数枚分(ここでは一例として3コマ)の連続撮影を指示する。CCD駆動回路112は、撮像素子103から3コマ分の画像データを逐一読み出す。これら3コマ分の画像データは、画像処理部104を介して、色信号処理やガンマ補正などが施された後、画像メモリ105に一時記憶される(図11S4)。

【0092】次に、マイクロプロセッサ106は、画像圧縮部106aにDCT変換(離散コサイン変換)を指示する。画像圧縮部106aは、画像メモリ105内の3コマ分の画像データについて、画面の所定領域(例えば、画面中央)を取り込んでDCT変換を施す(図11S5)。マイクロプロセッサ106は、DCT変換後の空間周波数成分を取り込み、3コマの中で一番高い空間周波数成分を含む画像データを選択する(図11S6)。

【0093】ここで、選択した画像データが一つの場合(図11S7のNO側)、マイクロプロセッサ106は、動作をステップS11に移行する。一方、選択した画像データが複数の場合(図11S7のYES側)、マイクロプロセッサ106は、選択した画像データの中で、高域の空間周波数成分が最も大振幅のものを選択する(図11S8)。

【0094】ここで、選択した画像データが一つの場合(図11S9のNO側)、マイクロプロセッサ106は、動作をステップS11に移行する。一方、選択した画像データがまだ複数の場合(図11S9のYES側)、マイクロプロセッサ106は、選択した画像データの中から、一番最初に撮影されたものを選択する(図11S10)。

【0095】このようにして画像データを一つに絞った後、マイクロプロセッサ106は、画像圧縮部106aを介してこの画像データに画像圧縮を施し、メモリカード108に記録する(図11S11)。以上説明した動作により、第4の実施形態では、連続的に撮像した画像

データの内から、高域の空間周波数成分が最も豊かな画像データを選択して記録する。したがって、手ブレや被写体ブレやピントズレなどが総合的に少ない画像データを適切に選択することが可能となる。

【0096】なお、第4の実施形態では、DCT変換などの直交変換を用いて画像データの空間周波数成分を精密に判定しているが、本発明はこれに限定されるものではない。例えば、公知の空間周波数フィルタ(例えば、隣接画素間で差分をとるなどのハイパスフィルタ)やコントラスト検出などを用いて、空間周波数成分を簡易に判定しても勿論よい。次に、別の実施形態について説明する。

【0097】(第5の実施形態)第5の実施形態は、請求項1, 2, 8, 9に記載の発明に対応した実施形態である。なお、第5の実施形態の構成については、第4の実施形態(図10)とほぼ同様であるため、ここでの構成説明を省略する。図12は、第5の実施形態の動作を説明する流れ図である。

【0098】以下、図12に従って、第5の実施形態の動作を説明する。まず、電子カメラ101の主電源が投入されると、マイクロプロセッサ106はリリース釦110が押されるまで待機する(図12S1のNO側)。ここで、リリース釦110が押されると(図12S1のYES側)、マイクロプロセッサ106は、測光部113を介して被写体輝度を測光し、適正露出を得るための露光時間を決定する(図12S2)。

【0099】次に、マイクロプロセッサ106は、エンコード115を介してズームレンズ102の焦点距離を検出する。また、マイクロプロセッサ106は、測距部114を介して被写体距離を検出する(図12S3)。ここで、マイクロプロセッサ106は、現在のモード設定が閃光撮影モードであるか否かを判定する(図12S4)。もしも閃光撮影モードの場合、手ブレや被写体ブレのおそれは低いので、マイクロプロセッサ106は、通常の撮影(1コマ撮像して記録する撮影)を実行した後(図12S5)、ステップS1に動作を戻す。一方、現在のモード設定が閃光撮影モード以外である場合、マイクロプロセッサ106は、下記の条件判別(1)、(2)を行う。

【0100】(1)露光時間が所定時間 τ よりも長い
(2)像倍率(\propto 焦点距離/被写体距離)が所定倍率 γ よりも大きい

これらの条件がいずれも不成立の場合(図12S6のNO側)、マイクロプロセッサ106は、手ブレや被写体ブレのおそれは少ないと判断して、通常の撮影を実行した後(図12S5)、ステップS1に動作を戻す。

【0101】一方、これらの条件のいずれか一方でも成立した場合(図12S6のYES側)、マイクロプロセッサ106は、ステップS7以降の対策動作を実行する。まず、マイクロプロセッサ106は、CCD駆動回

路112に複数枚分(ここでは一例として3コマ)の連続撮影を指示する。CCD駆動回路112は、撮像素子103から3コマ分の画像データを順次に読み出す。これら3コマ分の画像データは、画像処理部104を介して、色信号処理やガンマ補正などが施された後、画像メモリ105に一時記憶される(図12S7)。

【0102】次に、マイクロプロセッサ106は、画像圧縮部106aに画像圧縮を指示する。画像圧縮部106aは、1コマ目の画像データを試し圧縮し、所望の圧縮符号量に近づけるために適当なスケールファクタ(画像圧縮における量子化の条件を規定する公知のパラメータ値)を決定する。画像圧縮部106aは、このスケールファクタの値を一律に使用して、3コマ分の画像データを順次に画像圧縮する(図12S8)。

【0103】ここで、マイクロプロセッサ106は、3コマの画像データについて、圧縮後の符号量(圧縮符号量)を大小比較し、圧縮符号量の一番多い画像データを選択する(図12S9)。ここで、選択された画像データが一つの場合(図12S10のNO側)、マイクロプロセッサ106は、動作をステップS12に移行する。

【0104】一方、選択した画像データが複数の場合(図12S10のYES側)、マイクロプロセッサ106は、選択した画像データの中で、最初に撮影された画像データを選択する(図12S11)。このようにして画像データの一つに絞った後、マイクロプロセッサ106は、選択した画像データ(圧縮済み)をメモリカード108に記録する(図12S12)。

【0105】以上説明した動作により、第5の実施形態では、連続的に撮像した画像データの内から、圧縮符号量が1番多い画像データを選択してメモリカード108に記録する。したがって、高域の空間周波数成分が最も豊かで、手ブレや被写体ブレやビントブレが総合的に少ない画像データを、メモリカード108に記録することが可能となる。

【0106】なお、上述した第5の実施形態では、像倍率が所定倍率より大きくなると、良好画像(撮影状態の良好な画像)を選択するモードに入っているが、これに限定されるものではない。例えば、焦点距離が所定値より長い場合、良好画像を選択するモードに入るようにしてもよい。また、上述した第5の実施形態では、3コマの画像データを画面全域にわたって画像圧縮しているが、本発明はこれに限定されるものではない。例えば、3コマの画像データから画面内の所定エリア(例えば画面中央)のみを抜き出して画像圧縮を行い、評価用の圧縮符号量を求めてもよい。このような動作では、所定エリア内に限って空間周波数成分の比較が行われる。したがって、望遠撮影や流し撮りなど背景がぼけるような撮影条件にあっても、所定エリア内の鮮明な画像データを的確に選択することが可能となる。また、評価用の圧縮符号量を求めるに当たって、所定エリア内のみ画像圧縮

すれば足りるので、評価用の圧縮符号量を求めるための処理時間を格段に短縮することが可能となる。

【0107】さらに、上述した第5の実施形態では、3コマ分の連続撮影を全て完了した後で、3コマ分の画像圧縮を開始しているが、本発明はこれに限定されるものではない。例えば、前コマの画像圧縮と次コマの撮像動作とを同時並行に行うことにより、単位時間当たりの撮影枚数を増やしても勿論かまわない。特に、このような動作では、圧縮符号量の新旧比較を、撮像動作と同時並行に行うことが可能となるので、請求項6に記載の発明のように、より良い画像データを上書き記録する形態の電子カメラを構成することが可能となる。

【0108】なお、上述した第1～5の実施形態では、1枚の良好画像を保存するケースについて説明したが、本発明を複数枚の良好画像を保存するケースに適用することも可能である。例えば、露光ブラケットティング(露出条件を変えながら数枚撮影するモード)の場合は、同一の露出条件のもとで1枚の良好画像を保存する動作を、露出条件を変えながら繰り返せばよい。

【0109】また、上述した第1～5の実施形態では、電子カメラの表示機能について特に説明していないが、本発明に関連して様々な表示を行うことが可能である。例えば、電子カメラのモニタ画面やファインダ内に、「撮影状態の良否評価に応じて画像を選択するモード」などのモード表示を行ってもよいし、画像データの現在の標本数や、残りの標本数を絵や文字などを用いて表示してもよい。このような構成では、撮影者に対して電子カメラの動作状態を詳しく知らせることが可能となる。

【0110】その他、撮影状態の良否評価の結果(ブレ量の大きさなど)を絵や文字などを用いて表示してもよい。このとき、良否評価の表示と一緒に、一時記憶中の画像データを表示(例えばサムネイル表示)してもよい。このような構成では、撮影者が、画像の表示と良否評価の表示とを勘案した上で、所望の画像データを適宜に選択することが可能となる。また、撮影状態の良否評価が閾値以下になると警告表示(警報なども含む)を行ってもよいし、良否評価が極大になったことを知らせる表示(警報なども含む)を行ってもよい。このような構成では、撮影状態の良否が撮影者にフィードバックされるので、よりよい撮影状態に導くことが可能となる。

【0111】なお、上述した実施形態では、単体構成の電子カメラについて説明したが、本発明はこれに限定されるものではない。例えば、撮像ユニットと情報機器(コンピュータなど)とに分離構成された電子カメラに本発明を適用することも可能である。その場合の具体例としては、(1)撮像ユニット側で連続撮影した画像データを一時記憶する。(2)コンピュータ側のプログラム実行により、これら一連の画像データの中から撮影状態の良否評価に応じて画像を選択保存する、などの動作分担が考えられる。

【0112】さらに、本発明の適用範囲をコンピュータにまで拡大する場合には、「一連の画像データの中から、撮影状態の良否評価に応じて画像を選択保存する画像選択プログラム」をコンピュータ側で独立に実行してもよい。勿論、このような構成では、カメラ側からの撮影状態の情報収集が不十分になるなどの短所もあるが、空間周波数成分の良否評価であればコンピュータ単体でも実施可能なので、本発明の構成とおよそ同質な作用効果を得ることが可能となる。

【0113】

【発明の効果】

(請求項1) 請求項1に記載の発明では、連続的に撮像した画像データの中から、撮影状態が一番良好な期間に撮像された画像データを選択する。したがって、従来の手ブレ補正機構などを一切使用せずに、撮影状態の良好な画像データを得ることが可能となる。

【0114】したがって、従来の手ブレ補正用の光学系を省くことが可能となり、撮影レンズの小型化および軽量化を図ることができる。その上、手ブレ補正用の光学系を配置するためのスペースを、撮影レンズ内から省くことが可能となる。その結果、光学設計上の自由度が高くなり、撮影レンズの収差性能などを無理なく最適化することが可能となる。

【0115】また、従来の手ブレ補正用の光学系において生じていた僅かな内面反射も解消する。したがって、逆光撮影時のフレアが軽減し、撮像画質を一層向上させることができる。その上、従来の手ブレ補正用の駆動機構なども省くことが可能となり、電子カメラの省電力化を図ることができる。さらに、手ブレ補正用の駆動機構から騒音や振動が生じるという不具合も解消する。また、画像データの選択処理を撮影完了後に行うので、撮影期間中の処理負担はさほど増えず、単位時間当たりの撮影枚数がさほど減少しないという利点も生じる。

【0116】(請求項2) 請求項2に記載の発明では、一時記憶手段が、電子カメラのレリーズ操作後に、画像データの一時記憶を開始する。そのため、レリーズ操作前にあつては撮像動作を休止することが可能となる。したがって、電子カメラの省電力化を図ることができる。

【0117】(請求項3) 請求項3に記載の発明では、一時記憶手段が、レリーズ操作の前後にわたる画像データを保持する。したがって、レリーズ操作後の画像データに限らず、レリーズ操作の前後の期間から撮影状態のより良好な画像データを的確に選択することが可能となる。

【0118】また、レリーズ操作直前においては、レリーズ操作に伴う手ブレがまだ生じていない。したがって、撮影状態として手ブレを評価するような場合には、レリーズ操作の直前期間を画像データの標本区間に加えることにより、手ブレの非常に少ない画像データを高い確率で選択することが可能となる。その上、画像データ

の標本区間がレリーズ操作の前後にまたがって配されるので、同じ時間長の標本区間をレリーズ操作以降に配する場合に比べ、レリーズタイムラグの最悪値(画像データの標本区間の端点に該当する)をほぼ半減することができる。

【0119】(請求項4) 請求項4に記載の発明では、一時記憶手段と画像保存手段とが、同じ記憶機構を兼用する。したがって、一時記憶手段のために専用の記憶機構を備える必要がなく、電子カメラの構成を単純化することができる。

【0120】(請求項5) 請求項5に記載の発明では、連続的に撮像される画像データを差分圧縮した上で、一時記憶する。したがって、画像データの符号量を小さく抑えることが可能となり、一時記憶手段の記憶容量を極力小さくすることができる。また、一時記憶手段の記憶容量を変更しない場合は、一時記憶可能な画像データの標本数を増やすことが可能となる。この場合、より多数の画像データの中から選択を行うので、より撮影状態の良好な画像データを得る可能性が一段と高くなる。

【0121】(請求項6) 請求項6に記載の発明では、次々に撮像される画像データの中から、より撮影状態の良い画像データを選択的に残す。したがって、従来のような手ブレ補正機構などを一切使用せずに、撮影状態の良好な画像データを得ることができる。また、記憶媒体は、画像データが上書き記録されることとなるので、少なくとも1枚分の画像データを記憶する容量があれば足りる。したがって、一時記憶用に大容量の記憶媒体を備える必要がなく、電子カメラの構成を単純化することができる。

【0122】(請求項7) 請求項7に記載の発明では、撮影状態の良否評価として、撮像手段のブレ量を検出する。その結果、手ブレの少ない画像データを適切に選択して保存することが可能となる。

【0123】(請求項8) 請求項8に記載の発明では、撮影状態の良否評価の基準として、画像データの空間周波数成分を用いる。その結果、手ブレや被写体ブレやピントブレなどが総合的に少ない画像データを適切に選択して保存することが可能となる。特に、このような空間周波数成分の良否評価は計算により実行できるので、手ブレ検出用の圧電ジャイロなどが不要となる。したがって、請求項8に記載の発明を採用しても、従前からの電子カメラにセンサ部品などを付加する必要は特になく、本発明の効果を低コストかつ単純な構成で得ることが可能となる。

【0124】また特に、風に揺れる花のように、予測不能な動きを示す被写体については、通常のAF(自動焦点)撮影のみで、ピントブレを完全に防ぐことは非常に困難となる。しかしながら、請求項8に記載の発明では、このような悪条件下においても、空間周波数成分に基づいてピントブレの少ない画像データを確実に選択し

て保存することができる。

【0125】(請求項9) 請求項9に記載の発明では、空間周波数の高域成分量を、圧縮符号量から判断する。このような圧縮符号量の値は、従前からの画像圧縮処理の結果などから得ることができるので、特段の演算処理を付加する必要がなく、演算処理量や処理時間の軽減を図ることが可能となる。

【0126】(請求項10) 請求項10に記載の発明では、撮影状態の良否評価の一つとして、レリーズタイムラグを使用する。その結果、レリーズタイムラグの比較的小ない良好な画像データを選択して保存することが可能となる。特に、レリーズ操作の前から撮像画像の一時記憶を行っている状態において、レリーズタイムラグの少ない画像データを選択するようなケースでは、レリーズタイムラグが極めてゼロに近い画像データを得ることが可能となる。

【図面の簡単な説明】

【図1】請求項1に記載の発明を説明する原理ブロック図である。

【図2】請求項6に記載の発明を説明する原理ブロック図である。

【図3】第1の実施形態を示すブロック図である。

【図4】第1の実施形態の動作を説明する流れ図である。

【図5】ブレ量の時間変化を示した図である。

【図6】第2の実施形態を示すブロック図である。

【図7】第2の実施形態の動作を説明する流れ図である。

【図8】第3の実施形態を示すブロック図である。

【図9】第3の実施形態の動作を説明する流れ図である。

【図10】第4の実施形態を示すブロック図である。

【図11】第4の実施形態の動作を説明する流れ図である。

【図12】第5の実施形態の動作を説明する流れ図である。

【図13】手ブレ補正機構付きカメラの従来例を示す図

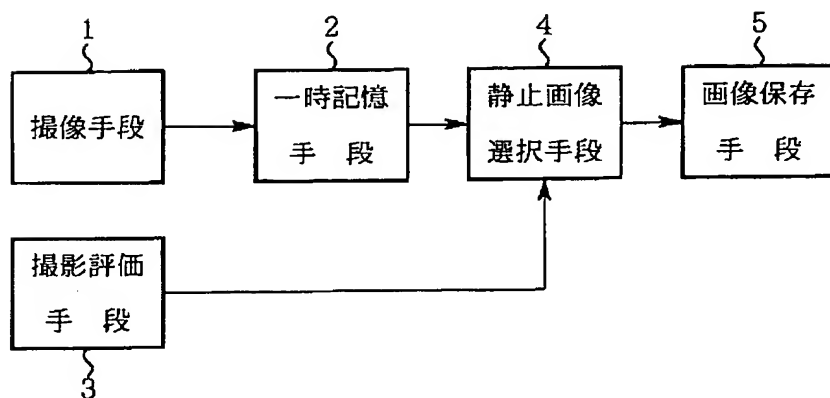
である。

【符号の説明】

- 1 撮像手段
- 2 一時記憶手段
- 3 撮影評価手段
- 4 静止画像選択手段
- 5 画像保存手段
- 10 記憶媒体
- 11 比較手段
- 12 画像書き込み手段
- 21, 41, 61, 91, 101 電子カメラ
- 22, 42, 62, 92 撮影レンズ
- 23, 43, 63, 103 撮像素子
- 24, 44, 64, 104 画像処理部
- 25, 45, 66, 105 画像メモリ
- 26, 46, 65, 106 マイクロプロセッサ
- 29a, 49a, 69a ブレ量検出センサ
- 29b, 49b, 69b ブレ量検出センサ
- 30, 50, 70, 110 レリーズ釦
- 31, 51, 71, 112 CCD駆動回路
- 32, 52 タイマー
- 33 赤外線転送インターフェース
- 47, 67 画像記録部
- 48, 68 メモリカード
- 93 ブレ補正光学系
- 94 コアレスモータ
- 95 コアレスモータ
- 96 ブレ量検出センサ
- 97 ブレ量検出センサ
- 102 ズームレンズ
- 106a 画像圧縮部
- 111 撮影モード選択釦
- 113 測光部
- 114 測距部
- 115 エンコーダ
- 116 閃光部

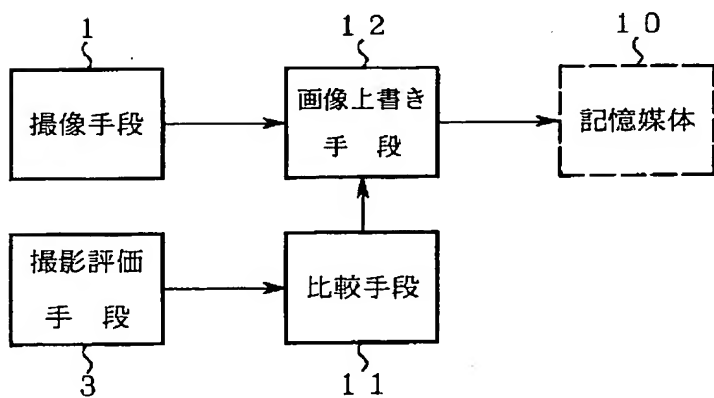
【図1】

請求項1に記載の発明を説明する原理ブロック図



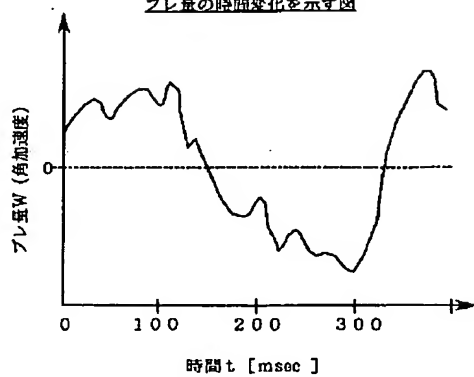
【図2】

請求項6に記載の発明を説明する原理ブロック図

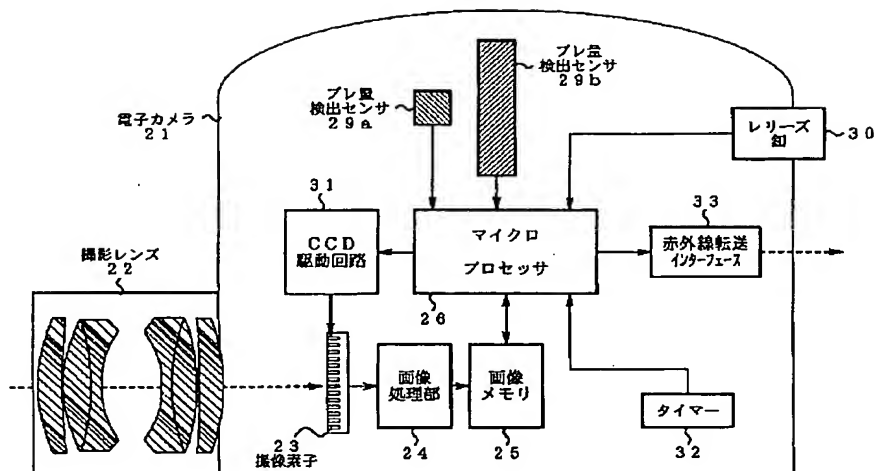


【図5】

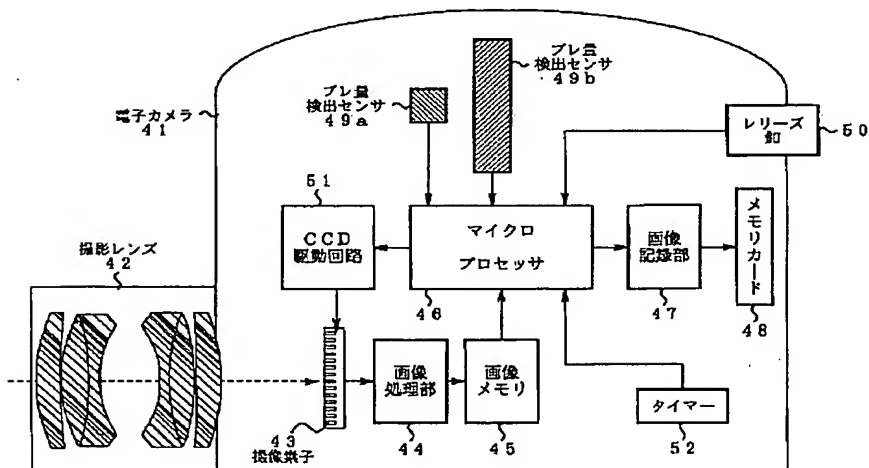
ブレ量の時間変化を示す図



【図3】

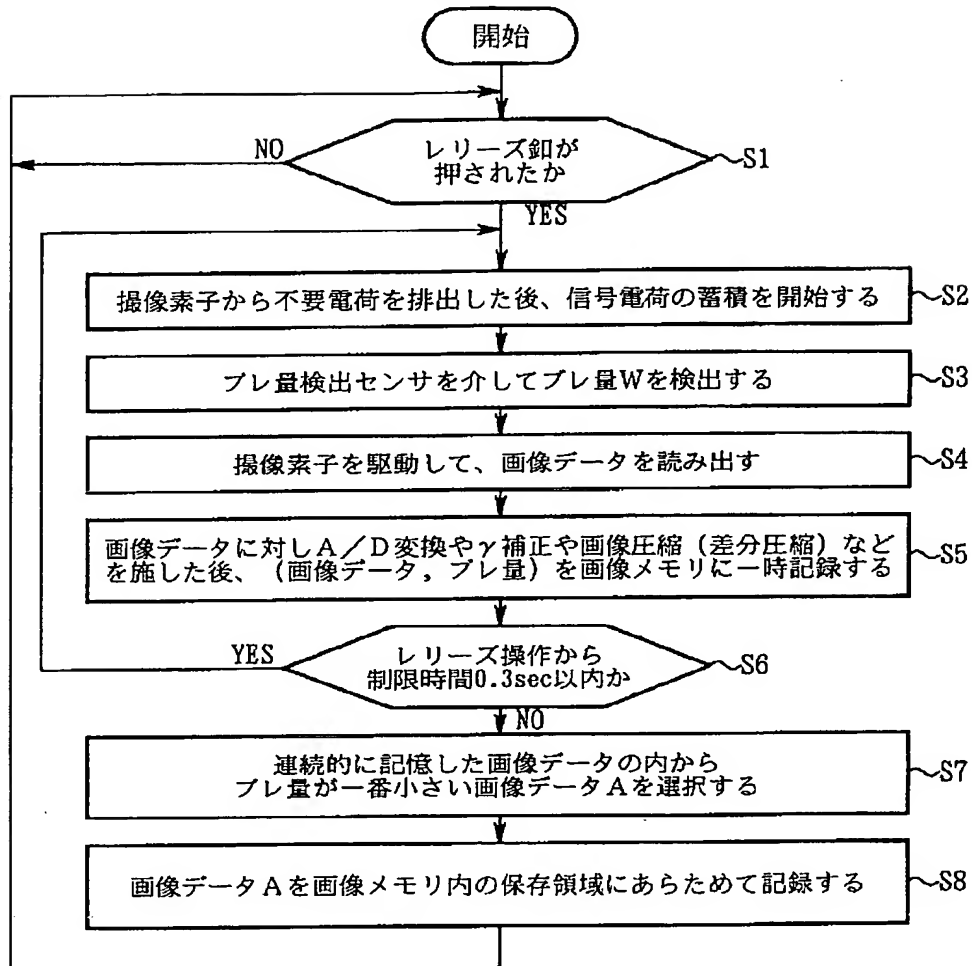


【図6】



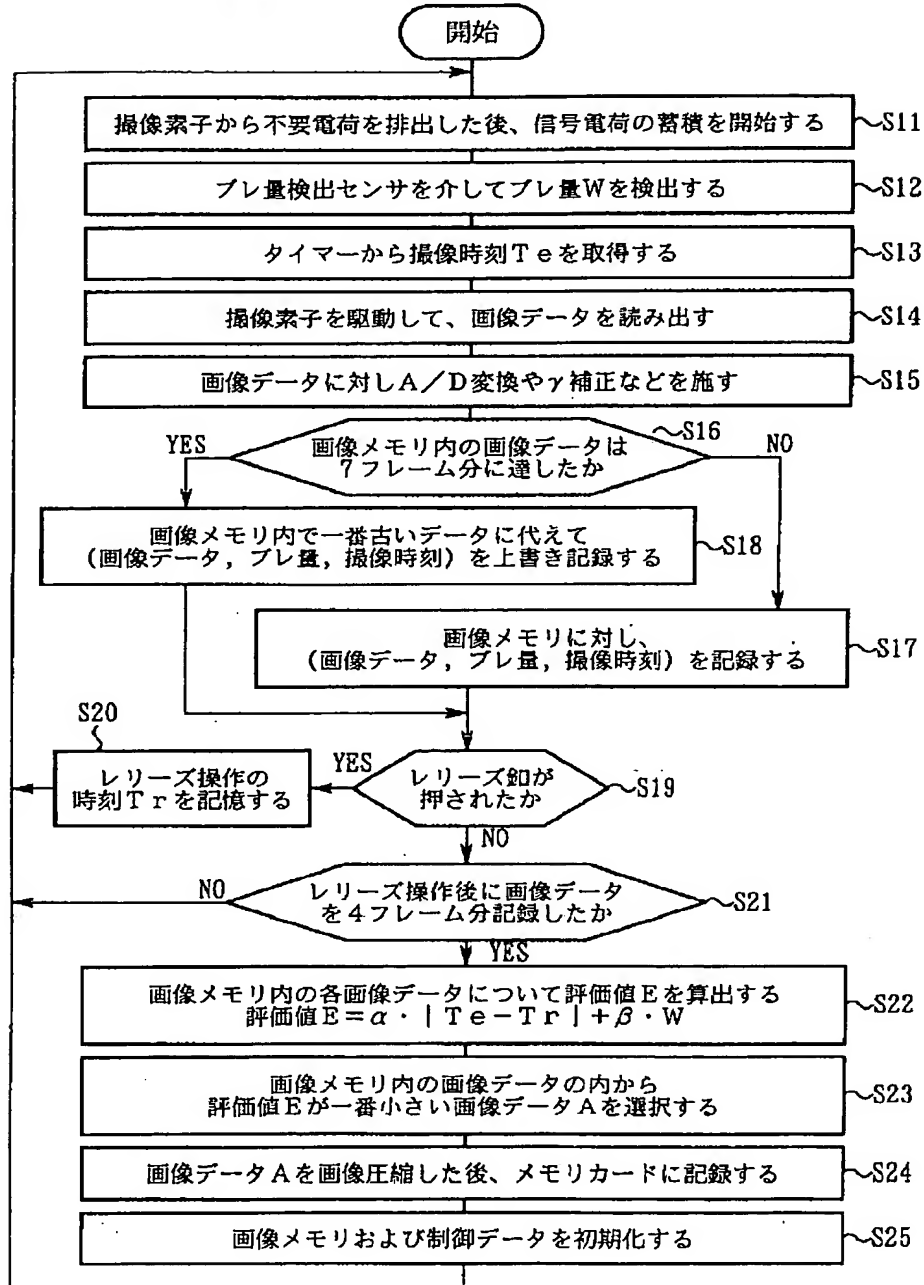
【図4】

第1の実施形態の動作を説明する流れ図

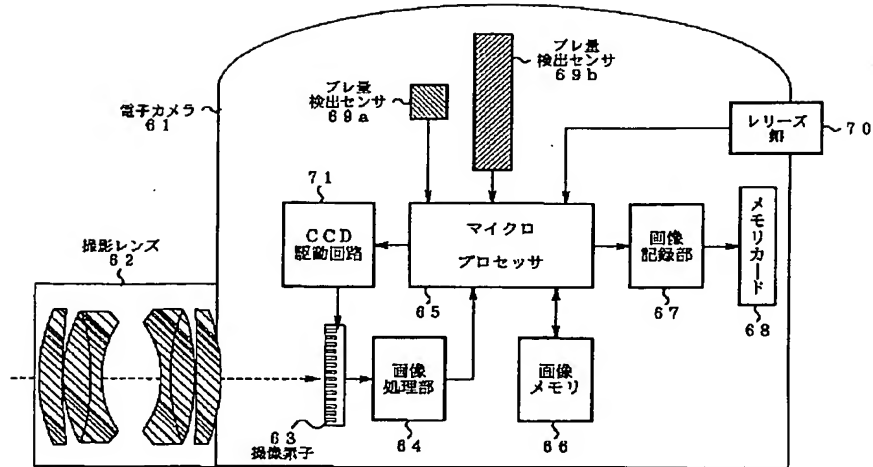


【図7】

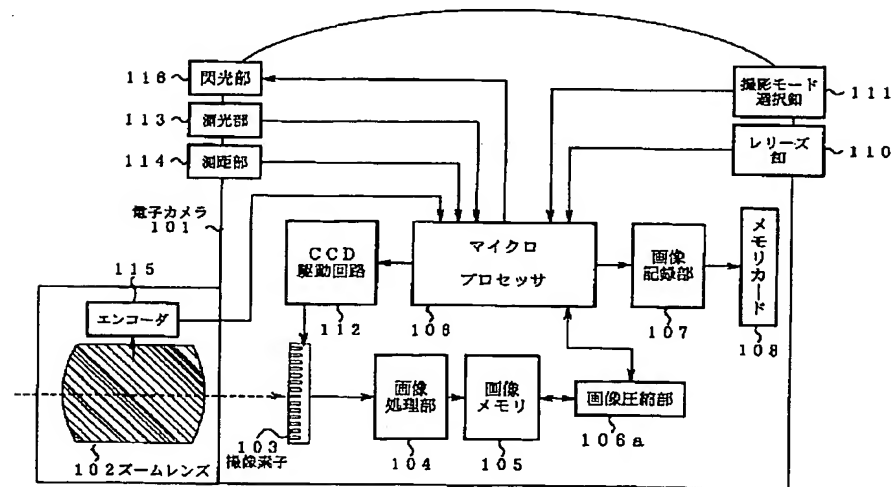
第2の実施形態の動作を説明する流れ図



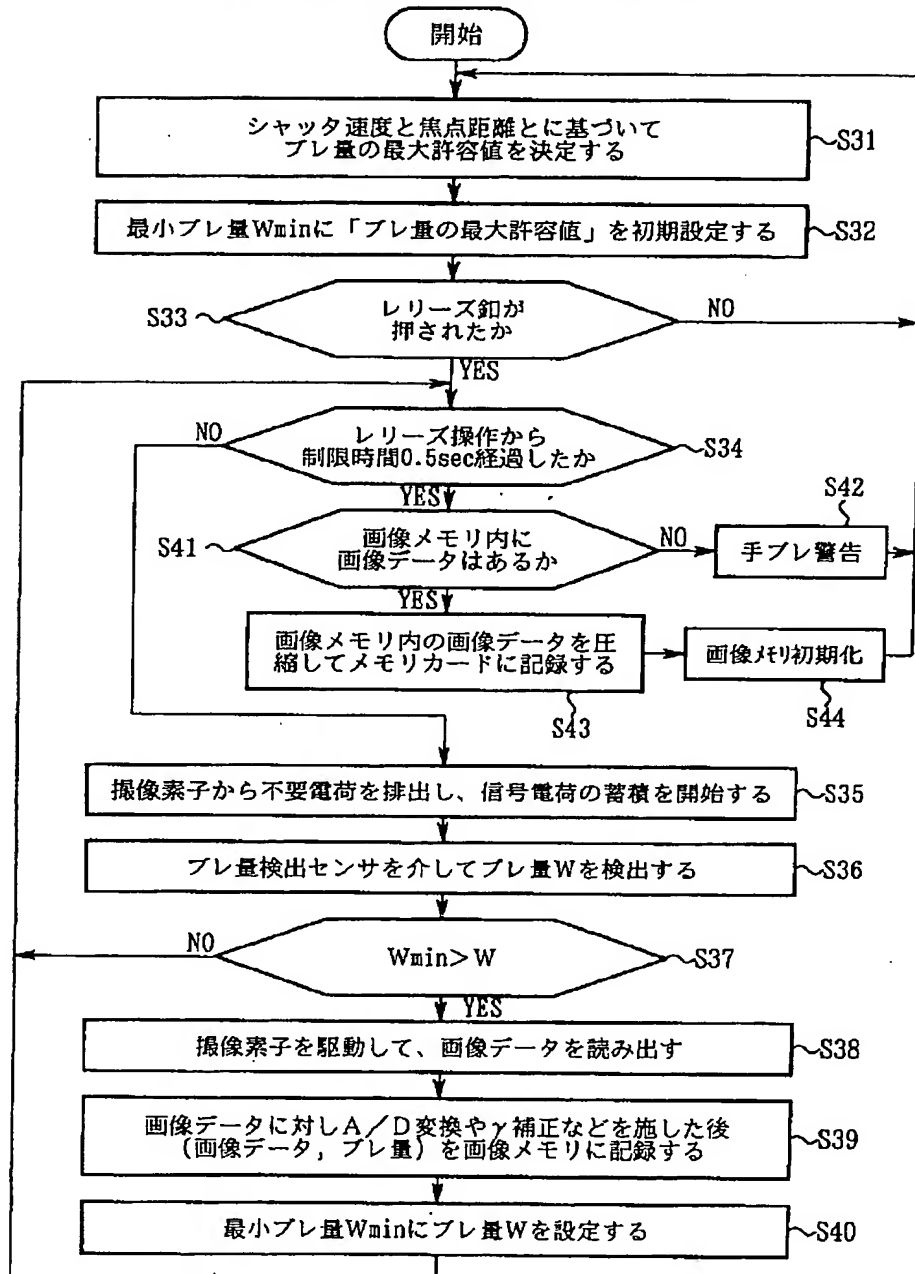
【図8】



【図10】

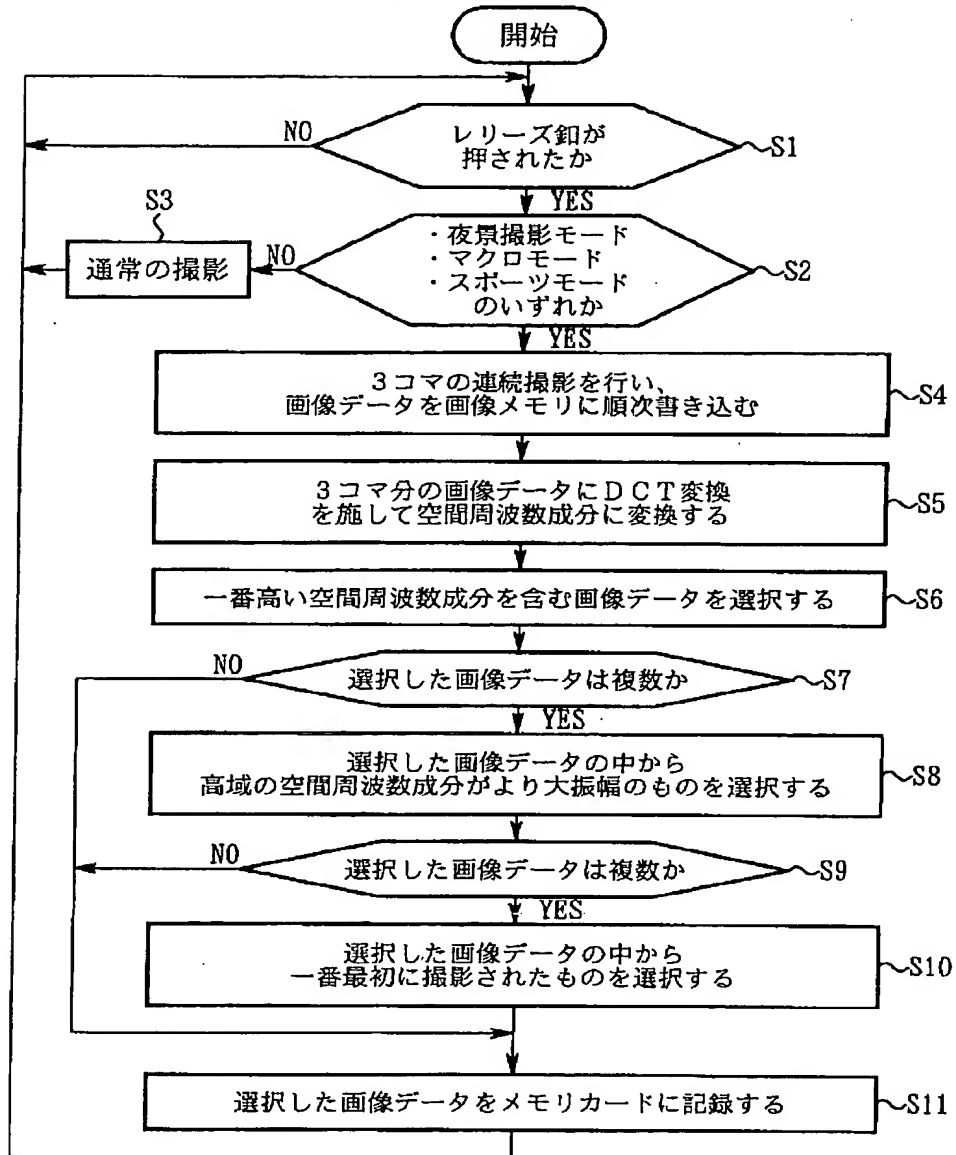


第3の実施形態の動作を説明する流れ図



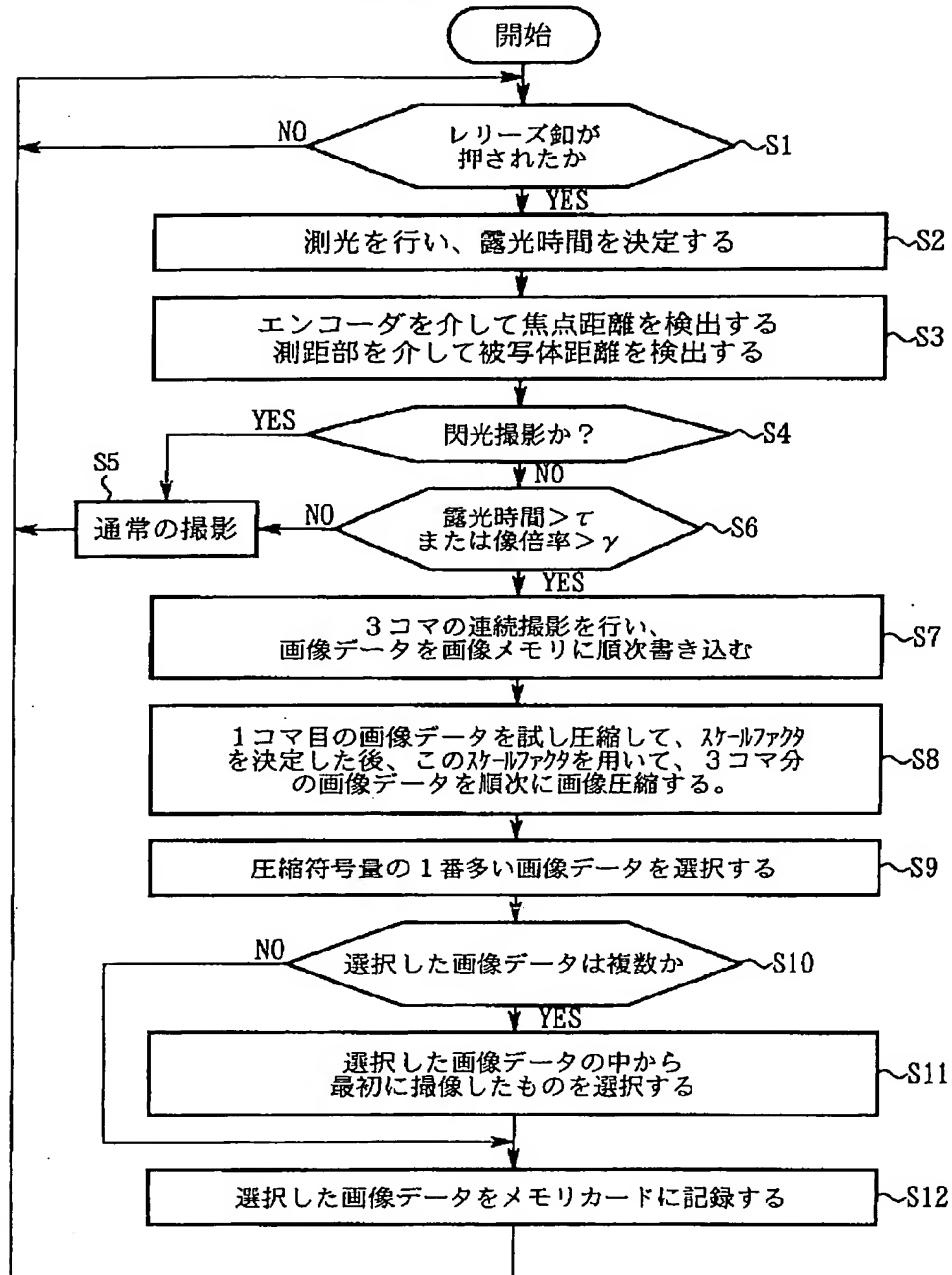
【図11】

第4の実施形態の動作を説明する流れ図



【図12】

第5の実施形態の動作を説明する流れ図



【図13】

手ブレ補正機構付きのカメラの従来例を示す図

